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# WORLD PETROLEUM

25 YEARS OF SERVICE TO THE INTERNATIONAL PETROLEUM INDUSTRY

# BRITISH OILFIELD EQUIPMENT CO. LTD.

(WHOLLY OWNED SUBSIDIARY OF *Cameron* IRON WORKS, HOUSTON, TEXAS)

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To: International Oil Operators
All Over the World

Gentlemen:

We are pleased to announce that British Oilfield Equipment Co. Ltd. is now a wholly owned subsidiary of Cameron Iron Works, Inc. of Houston, Texas.

Our manufacturing plant is located at Leeds, England, with general sales offices in the Time and Life Building, New Bond Street, London, W. 1. The principle business of BOFEC since 1950 has been to manufacture under license a number of Cameron products including blowout preventers, well heads, Christmas tree fittings and more recently mud valves.

A complete range of Cameron products will be available for immediate delivery and sale from the United Kingdom. All Cameron equipment manufactured and sold by BOFEC is identical in all respects and interchangeable with that made at our main plant in Houston, Texas.

We pledge our continuing best efforts to successfully serve you.

Very truly yours,

BRITISH OILFIELD EQUIPMENT CO. LTD.

Herbert Allen

Director

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(TO CUT STUCK CASING INSTANTLY)

*or the* **BOTTOM HOLE JET CUTTER**

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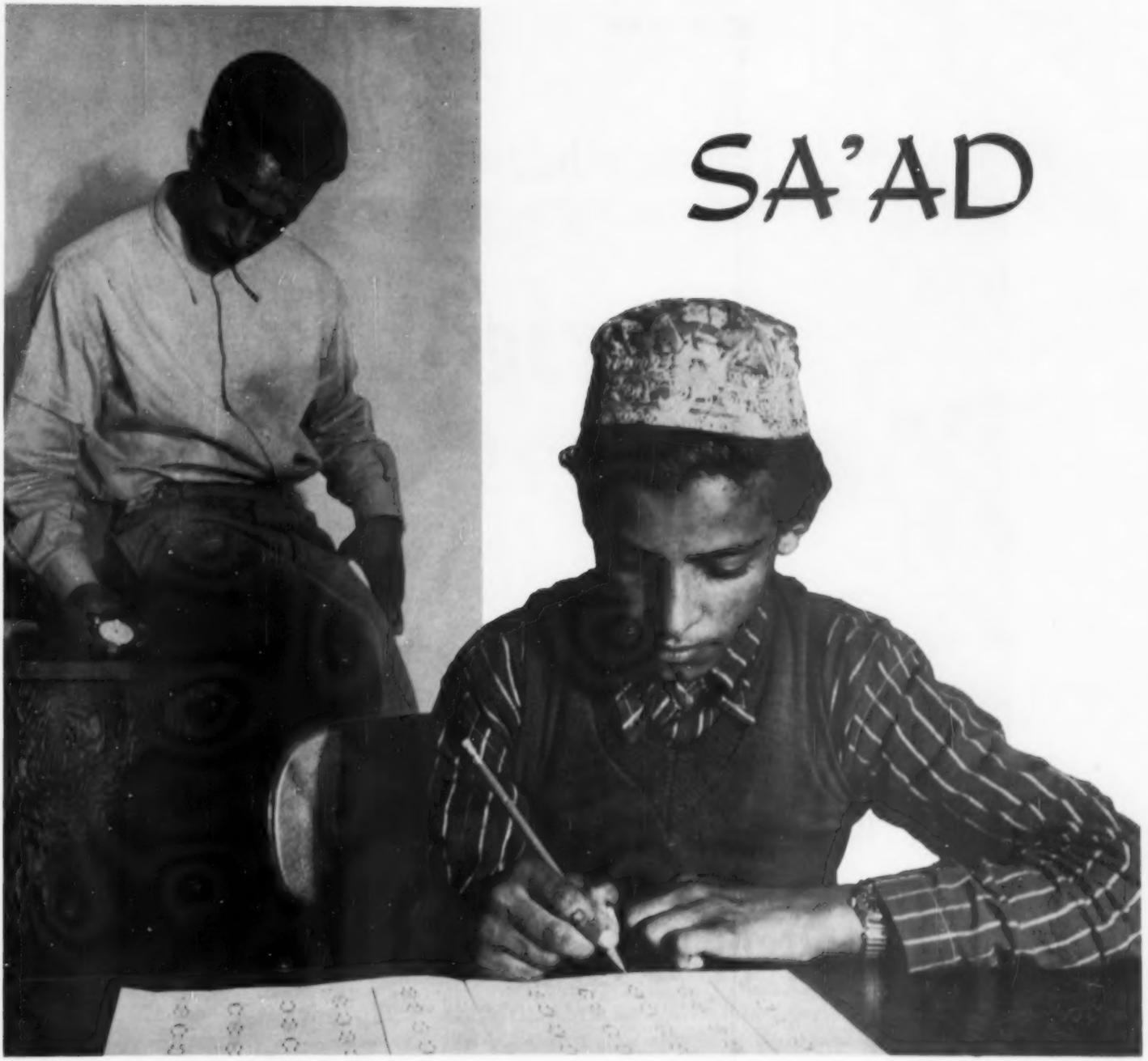

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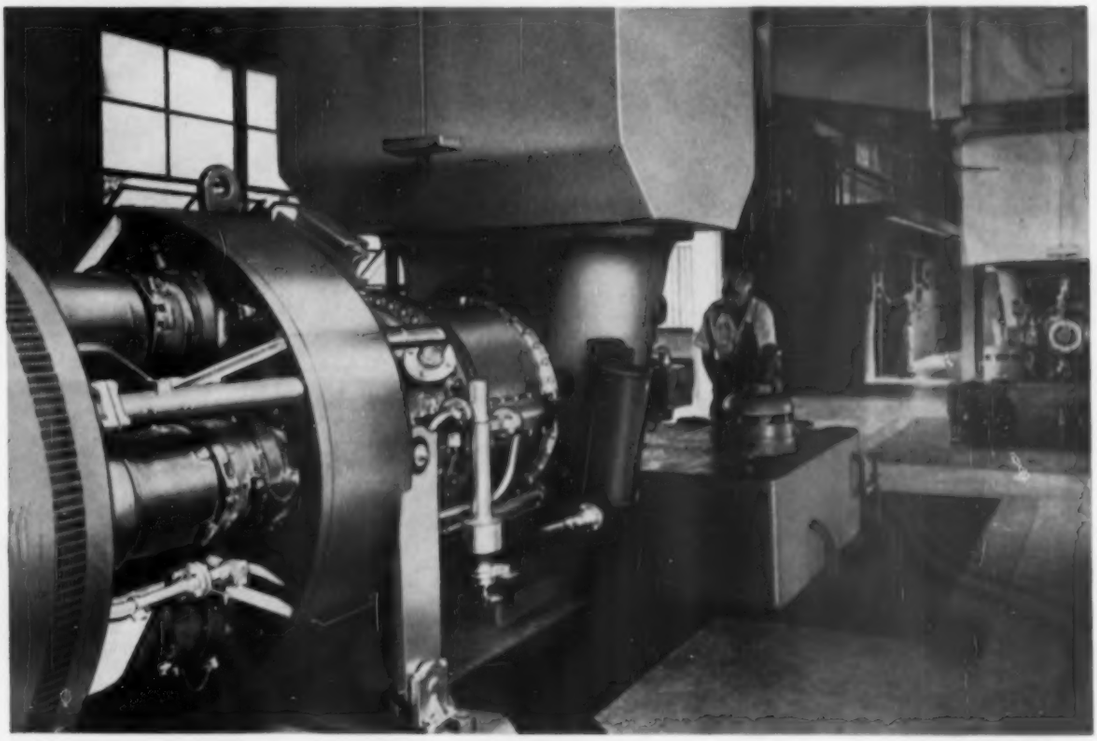
## G. E. Reports On Electrical Developments . . . No. 6



# G-E GAS TURBINES SET WORLD OPERATING RECORD

If you plan new power in your plant, consider these performance facts and figures:

**WORLD'S RECORD.** There are now 70 G-E gas turbines in operation. They have delivered more than 350,000 hours of service, equal to 40 machine years. This is a world's record. At one utility, a G-E unit has had only 34 hours of unscheduled downtime during more than 31,000 operational hours. Another has had none at all in 9,000 hours. A natural-gas firm, after its gas turbine's initial tune-up, has had less than 1% downtime due to mechanical or electrical failure. Gas Turbine electric locomotives have logged 1,750,000 miles.

**EXTRA HORSEPOWER.** Gas turbines are cheaper to run, cost less to install. They require little maintenance and manpower to run them. Semi-automatic and self-protecting, gas turbines provide up to 25% additional horsepower at lower ambient temperatures. Learn the value of the gas turbine to your plant. Consult your nearest G-E representative. *International General Electric Company, Apparatus Sales, 570 Lexington Ave., New York 22, N.Y., U.S.A.* 16-84-10

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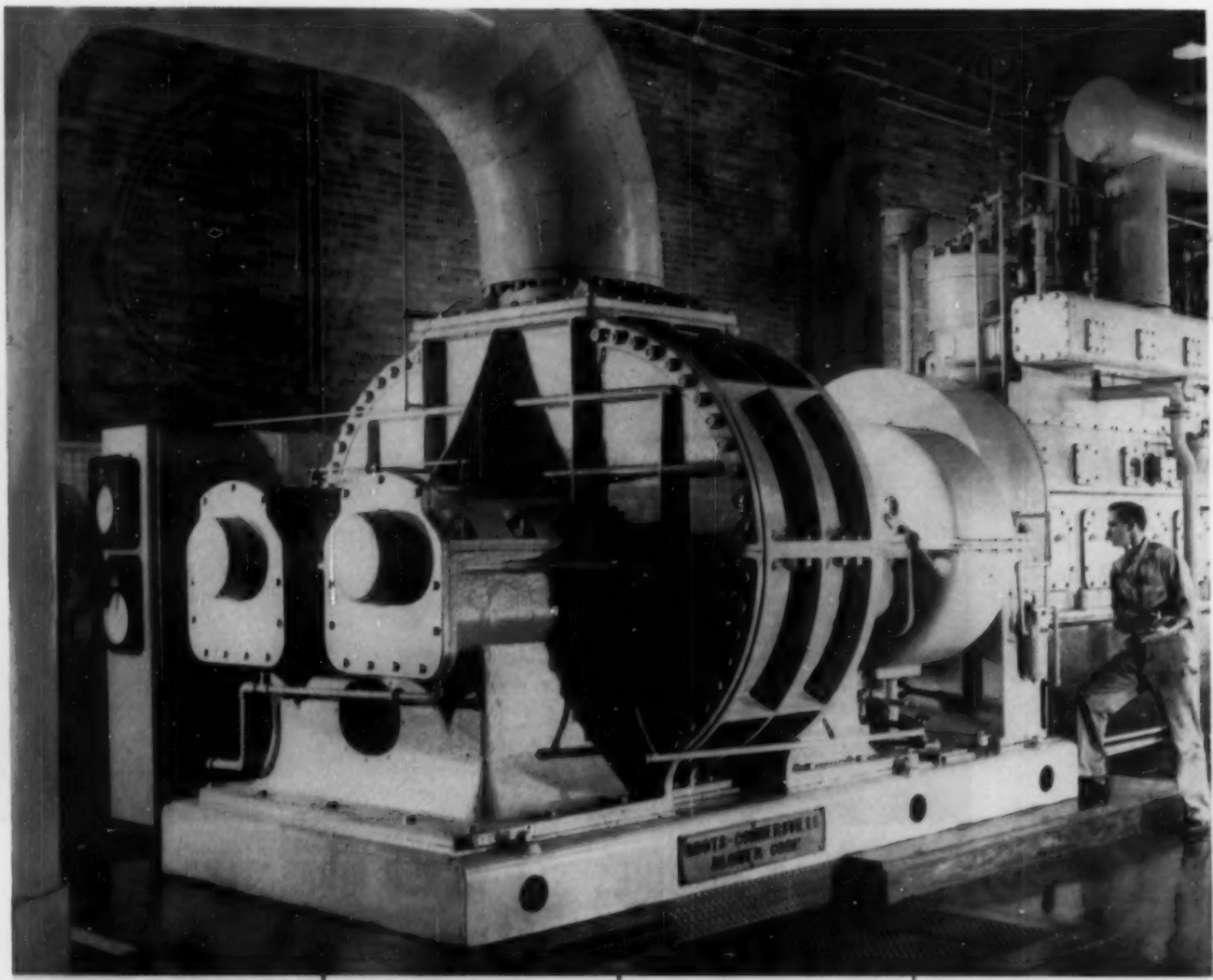

**IDECO**

IDECO, Dallas, Tex.—Hydrair and Power Rigs; Full-View Masts; Substructures; Single, Dual and Drive-In Rambler Rigs; Blocks, Swivels, Rotaries; Mud-Pumps; Petroleum Equipment and Supplies.

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**Pacific Pumps inc.**

PACIFIC PUMPS, INC., Huntington Park, Calif. — Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells.

## the blower with the extra boost

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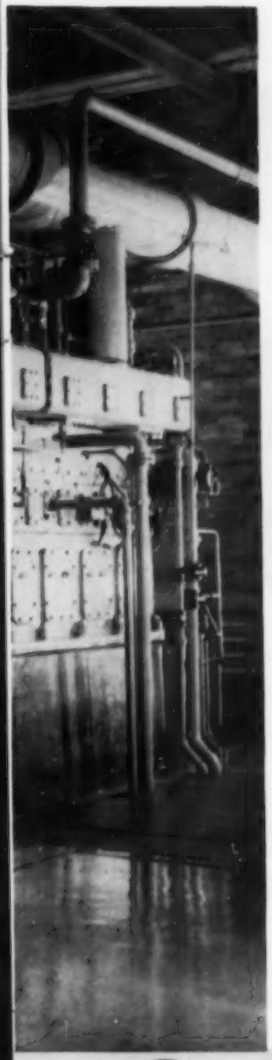
Now entering its second century of service, the Roots-Connersville Blower Division of Dresser Industries has pioneered the development of efficient equipment designed to move gas and air under moderate pressures. Roots-Connersville gas pumps, blowers and related products have won world-wide recognition for superior design and watch-like precision. Serving many industries, Roots-Connersville manufactures both rotary positive and centrifugal blowers and exhausters, plus an extensive line of gas and vacuum pumps, rotary positive displacement meters, and inert gas generators.



# How the DRESSER *plus* + works...

Providing dependable, economical service to an important industrial area, a major Illinois utility company is backed up by an all-star Dresser team. Illustrated at left, a *Roots-Connersville* RCGH gas booster, driven by a *Clark* gas engine, compresses natural gas to 10 pounds per square inch gauge pressure at the rate of one million cubic feet per hour. Popular *Dresser* couplings – used to connect sections of the engine exhaust pipe – are also on the top-flight team putting the Dresser *plus* + to work at this natural gas pipe line booster station. Still more Dresser products work at other tasks in the same plant.

At thousands of industrial installations all over the world, many Dresser products work together in the growing task of producing and processing the fuels and chemicals vital to modern civilization. And behind each of these products stands the combined research, experience, and engineering facilities of all the Dresser companies.

You, too, can put the Dresser plus + to work for you when you use any Dresser product or service, *standard of comparison the world over.*

ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind.— Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, and positive displacement meters.

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MAGNET COVE BARIUM CORP., Houston, Tex., Malvern, Ark.— Magcobar and Magcogel drilling muds and other specialized oil well drilling fluids and chemicals.

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As compared with other forms of asbestos insulation, CAPOSITE enjoys one very considerable advantage. This is in the matter of fibre-length — a key factor in the thermal efficiency of all asbestos materials. CAPOSITE is made from the uniquely long-fibred type of asbestos known as *amosite*, obtained from The Cape Asbestos Co's own mines. This extra length of fibre gives it a long start, both in thermal efficiency and in other important respects as well; in greater durability, for example, without any corresponding excess of weight. CAPOSITE is available in moulded form to suit the contour of the surface to be insulated. It is easily applied, combining lightness in weight with exceptional strength and durability. CAPOSITE insulations are designed for use up to 1,000°F. For temperatures in excess of 1,000°F there is a complete range of CAPOSIL High Temperature Insulations.

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PETROLEUM CHEMICALS DIVISION
# NEWS

February ★ One of a Series of Interest to the Petroleum Industry ★ 1955

## NEW BOOKLET

***to help you explain surface ignition to non-technical people***

Outside of a small group of specialized engineers, few people understand surface ignition.

What causes it? How does it manifest itself? What are its harmful effects? And what can you do to overcome the problem?

The chances are you are frequently asked these questions, by outsiders and executives of your own company. But accurate, clear-cut, easy-to-understand answers are often hard to come by.

So to help you promote a better and wider understanding of surface ignition, and the problems surrounding it, Du Pont has prepared an eight-page booklet entitled "Combustion and Surface Ignition." It is profusely illustrated in full color. And it explains quickly and understandably the phenomenon of surface ignition and the technical terms used to describe it.

The booklet is now available to fuel engineers for limited distribution. Any of our regional offices will be glad to supply you with a sample copy and information on obtaining additional copies.

## Unique Dust-Injection Engine for Studying Surface Ignition

In order to study the erratic process of surface ignition under controlled conditions, engineers at the Du Pont Petroleum Laboratory have developed a novel technique, called the "aspirated deposit surface ignition test."

**In this modified C.O.T. engine with electronic counter, engineers can create controlled surface ignition by introducing a small amount of powdered combustion chamber deposit.**

The technique uses a single-cylinder engine, modified to permit the introduction of a small amount of combustion chamber deposit into the intake port. This *dust-injection* engine uses a fuel susceptible to surface ignition, containing benzene or diisobutylene. To isolate chemical reactions associated with surface ignition, the engine operates under typical non-knocking conditions.

### Pin-pointing ping

The number of surface ignitions caused by the introduction of the combustion chamber "dust" is taken as the measure of surface ignition harm of deposits.

Surface ignition is detected by an internal type of pickup, mounted in the engine cylinder. The number of surface ignitions is counted by a four-decade counting unit actuated by a signal from the pickup.

Findings from this unique test method reveal the relationship between the composition of combustion chamber deposits and their contribution to surface ignition.

## A New Company With Established Services For Your Canadian Operations

DU PONT COMPANY OF CANADA LIMITED, and its Petroleum Chemicals Division, offer a wide range of marketing, technical and safety services to all oil companies operating north of the border. If you are considering expansion in or to Canada, these services can have an important bearing on your plans.

**THESE THREE** *recently completed forecasts deal with the Canadian market exclusively. They cover gasoline, passenger cars, commercial vehicles and farm tractors—for the period from 1954 to 1960. They are offered as an oil industry service by Du Pont of Canada.*

Suppose, for example, you want to build a new refinery in Alberta. You want to employ local workers wherever possible. But training local blending plant personnel in the safe handling of tetraethyl lead presents a real problem. To transport a special training crew from the States is likely to prove difficult and costly.

Here is a typical case where a Du Pont of Canada representative can be extreme-

OVER

*ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)*

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *Du Pont of Canada*

ly valuable to you. And in addition to helping with employee training and safety projects, the Canadian representatives are prepared to offer many specialized services in connection with the design, site selection, construction, and operation of your blending plant.

**Who, what, where? . . .**

Du Pont of Canada is a separate, individual company . . . one of two companies recently formed out of the former Canadian Industries Limited.

Its Petroleum Chemicals Division has its headquarters in Toronto, with branch offices in Montreal and Calgary. It handles the complete Du Pont line of lube oil, fuel oil and grease additives, as well as gasoline dyes, antioxidants, Metal Deactivator and tetraethyl lead.

The Canadian sales-service representatives have had the same extensive technical training and oil industry experience as their stateside colleagues. And the services they offer are exactly parallel, too.

**Developing a new market**

With all forecasts pointing to a tremendous expansion in the Canadian economy during the next few decades, it can be expected that petroleum products marketing, as well as production and refining, will play an increasingly important role in Canadian Oil Industry activities.

To help you make the most of this growth potential, a wide range of movies, booklets, special presentations and other sales promotion aids are available to Canadian marketers through Du Pont of Canada. And this service also includes such industry-wide public relations programs as the well-known Du Pont "Magic Barrel."

**Laboratory services, too**

Although the five Du Pont Petroleum Chemicals Division regional laboratories are located in the United States, the services of these unique laboratories are available to all Canadian oil companies.

What's more, the Petroleum Chemicals Division of Du Pont of Canada is backed up by the basic research activities of the Du Pont Petroleum Laboratory and Experimental Station in Wilmington.

So if you are now operating in Cana-

*Continued—bottom of next column*

da or plan to in the future, be sure to keep in touch with one of the Du Pont of Canada Petroleum Chemicals Division representatives. He can be a very helpful man to know.

## CANADIAN MANAGER

MILTON A. DEWEY is manager of the Petroleum Chemicals Division, Du Pont Company of Canada Limited.

After graduating from the University of Illinois with a B.S. degree in Chemical Engineering, he joined the Mid-Continent Petroleum Corporation in Tulsa, Oklahoma as a refinery engineer. Mr. Dewey left Mid-Continent to accept a research fellowship at Pennsylvania State College—working in the Petroleum Refining Laboratory, sponsored by the Pennsylvania Grade Crude Oil Association.

He then joined the staff of the Gulf Research Corporation in Pittsburgh and later became head of this company's Analytical Laboratory, in charge of research on turbine and electrical oil additives.

Mr. Dewey came to Du Pont in 1937. One of his first jobs at Du Pont was as liaison between the oil company research laboratories and various Du Pont laboratories. In this capacity, product development work was one of his chief responsibilities.

**MILTON A. DEWEY**

In 1950, he was transferred to Canadian Industries Limited, in charge of petroleum chemicals sales. He continued in this assignment until Du Pont of Canada was formed last July, at which time he was appointed to his present position.

## Sales Opportunity for Lube Oils With Low-Duty Detergents

For 48% of American passenger cars, the average trip is less than 4 miles. For 75%, it is less than 10 miles. For only 15% it is 16 miles or over. And for all city busses, taxis and delivery trucks, more than 90% of their total operation is local stop-and-go traffic.

And these low-power, low-temperature operating conditions lead to excessive build-ups of engine sludge.

But these adverse driving conditions do not necessarily represent an obstacle to you. You can turn them into a real sales opportunity for your brand of motor oil. How? . . .

By adding one of the new polymeric lube oil additives to your motor oil (Du Pont Lube Oil Additives 564 and 565).

Being outstanding detergents and viscosity-index improvers, these double-action additives are exceptionally effective and economical for retarding sludge formations caused by low-power, low-temperature driving conditions. And being ashless, they leave no metallic deposit.

For more details on these new additives, contact any of our regional offices listed below.

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# Petroleum Chemicals

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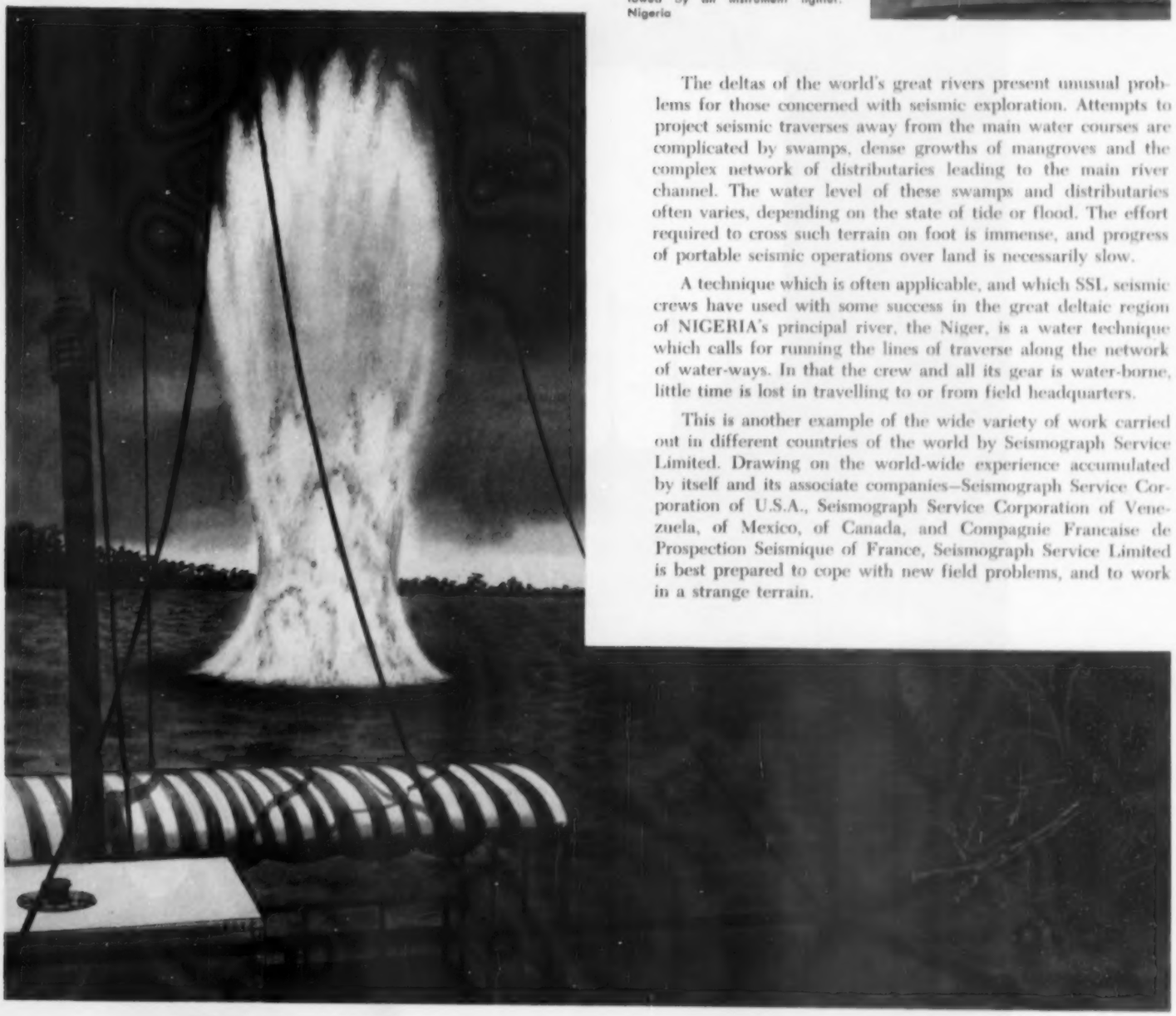
# OIL
## MUST BE DISCOVERED

Floating geophone cable being towed by an instrument lighter. Nigeria



The deltas of the world's great rivers present unusual problems for those concerned with seismic exploration. Attempts to project seismic traverses away from the main water courses are complicated by swamps, dense growths of mangroves and the complex network of distributaries leading to the main river channel. The water level of these swamps and distributaries often varies, depending on the state of tide or flood. The effort required to cross such terrain on foot is immense, and progress of portable seismic operations over land is necessarily slow.

A technique which is often applicable, and which SSL seismic crews have used with some success in the great deltaic region of NIGERIA's principal river, the Niger, is a water technique which calls for running the lines of traverse along the network of water-ways. In that the crew and all its gear is water-borne, little time is lost in travelling to or from field headquarters.

This is another example of the wide variety of work carried out in different countries of the world by Seismograph Service Limited. Drawing on the world-wide experience accumulated by itself and its associate companies—Seismograph Service Corporation of U.S.A., Seismograph Service Corporation of Venezuela, of Mexico, of Canada, and Compagnie Francaise de Prospection Seismique of France, Seismograph Service Limited is best prepared to cope with new field problems, and to work in a strange terrain.

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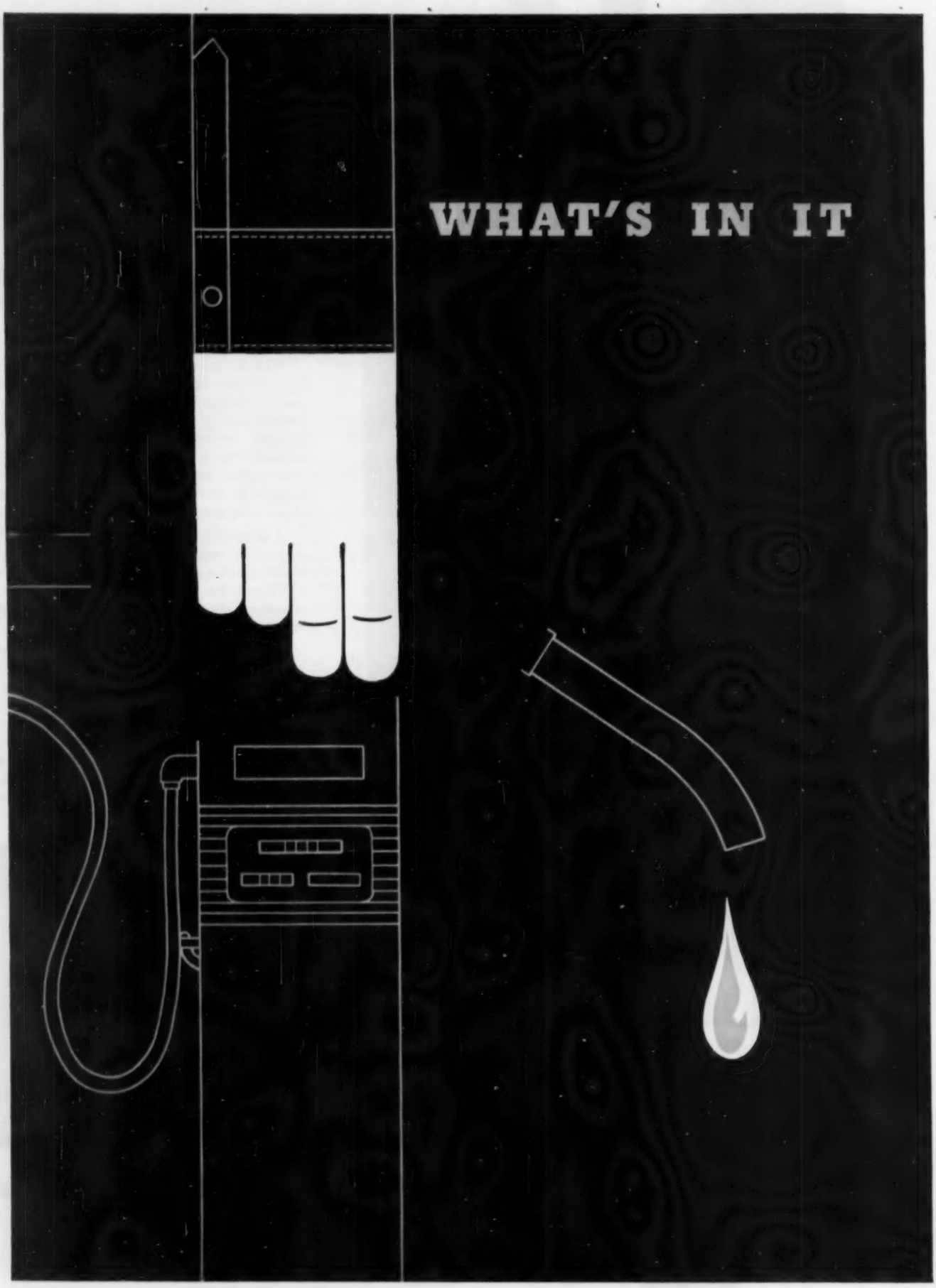
WHAT'S IN IT

# FOR YOU?

## *How do you . . . or any other refiner . . . benefit from the installation of the UOP Platforming process?*

If you are among the many refiners who have Platformers, you will know the answer to these questions. For instance . . . you will know that Platforming provides an economical method by which you can raise the octane ratings of straight run, natural and thermally cracked gasolines efficiently and economically to conform to your marketing requirements. Likewise, you may know that Platforming enables you to produce benzene, toluene, xylenes, and other aromatics which are readily recovered in an extraction process. And you will also know of the many advantages you receive from operating under a license from Universal Oil Products Company because of its well-established service policies which assure you of top notch performance at all times.

Platforming is the pioneer catalytic reforming process which first used platinum catalyst. Because of the nature of the Platforming catalyst, its activity is maintained for long operating periods without regeneration, resulting in important economies. And the unusual simplicity of operation throughout the entire unit is responsible for further savings.

Gasolines made by the UOP Platforming process have proved their leadership among motor fuels. They meet and beat severe competition, and build gallonage in any market . . . on a most profitable basis.

These are just a few of the advantages offered by this pioneer process . . . a few of the reasons why refiners the world over say, there's a lot in it for you.

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When the flow of oil must wait for the erection of new plant, the degree of skill and resource brought to the work of construction is a major economic factor. For this skill there is no firm grounding other than wide, first-hand, practical experience of process engineering for petroleum and petrochemicals, of the kind possessed by D. & C. and William Press Ltd.

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The Standard-Vacuum organization is continually expanding its educational and training programs for its 40,000 employees in the various areas where it operates.

In Indonesia, for example, 71 formal training courses as well as on-the-job instruction are giving several thousand men new skills . . . teaching them to work as a team and to produce more . . . improving their ability to shoulder responsibility . . . adding to their economic security as individuals and their economic strength as citizens.

Stanvac seeks to do its part in developing the capacities of its employees so that they become better qualified to carry on the company's operations and to participate in supervisory and administrative functions.

*Greater knowledge is truly a power for good.*

**STANDARD-VACUUM OIL COMPANY**

*A name that stands for "Progress" in the East*

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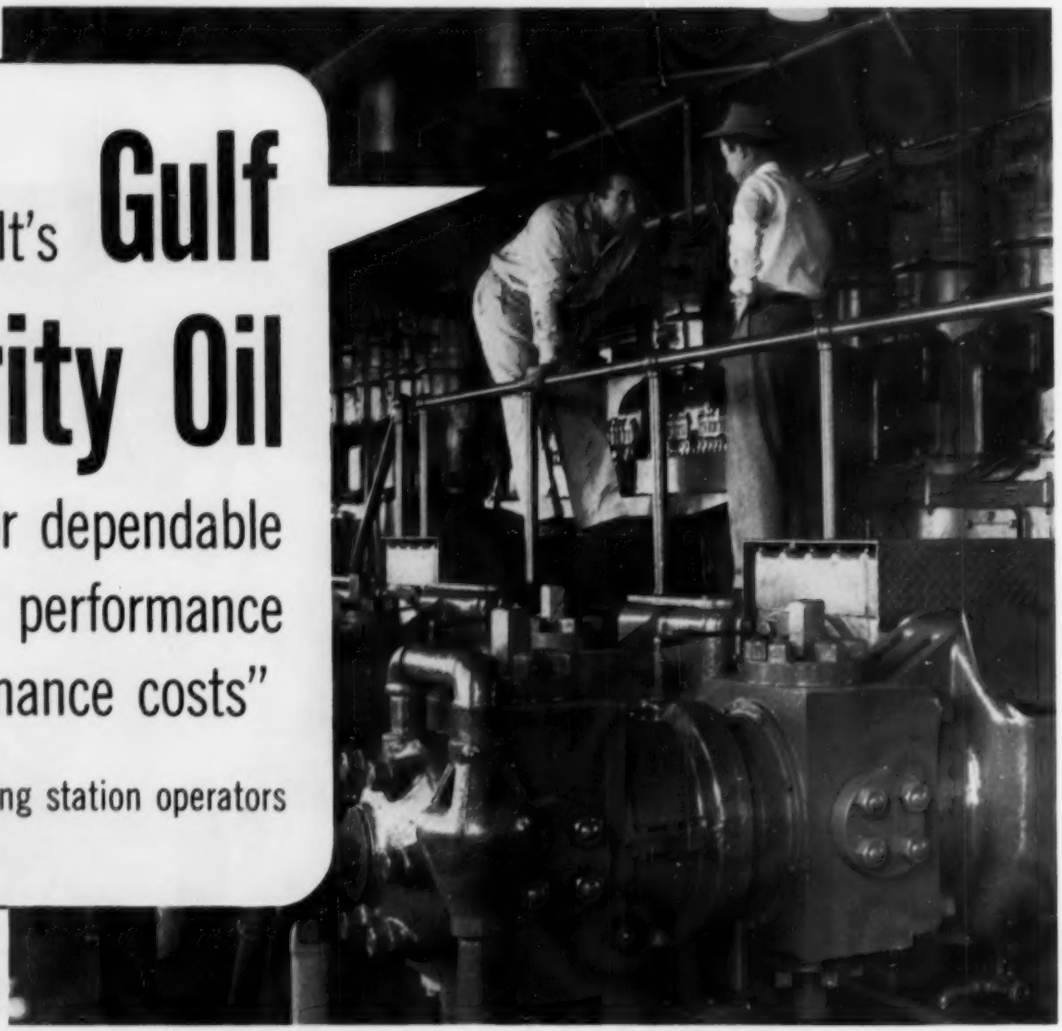
"It's **Gulf**

# Security Oil

for dependable
gas compressor performance
and low maintenance costs"

say pumping station operators



Smooth, continuous operation is a must for these units in service at a South Texas gas compressor plant. They are responsible for the steady flow of essential natural gas through pipe lines to homes and industries as far north as Detroit and New York. Gulf Security Oil provides the sure, effective protection needed for cylinders and bearings in both engines and compressors.

You can depend on Gulf Security Oil to provide the proper lubrication that is so important to vital compressor units if operating troubles are to be prevented and maintenance costs kept low.

Gulf Security Oil has a record of outstanding performance in scores of gas transmission plants. After years of operation with this quality oil, the cylinders and piston rings of both the compressors and power assemblies show negligible wear. And few carbon deposits have formed on power cylinder ports and pistons.

If you are installing new compressor units, or feel that you're not getting the most effective lubrication possible for your present units, it will certainly pay you to try Gulf Security Oil. Contact your nearest Gulf Office and have a Gulf Sales Engineer call.

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# wiggins floating roofs

## By GENERAL AMERICAN

The Wiggins roof floats on the surface of a stored product and the triple seal protection turns practically all pumping and standing losses into savings. Simple design keeps maintenance low. Tested and approved under all weather conditions.

Only the Wiggins Floating Roof has all the specifications which 30 years' experience has proven necessary for best performance.

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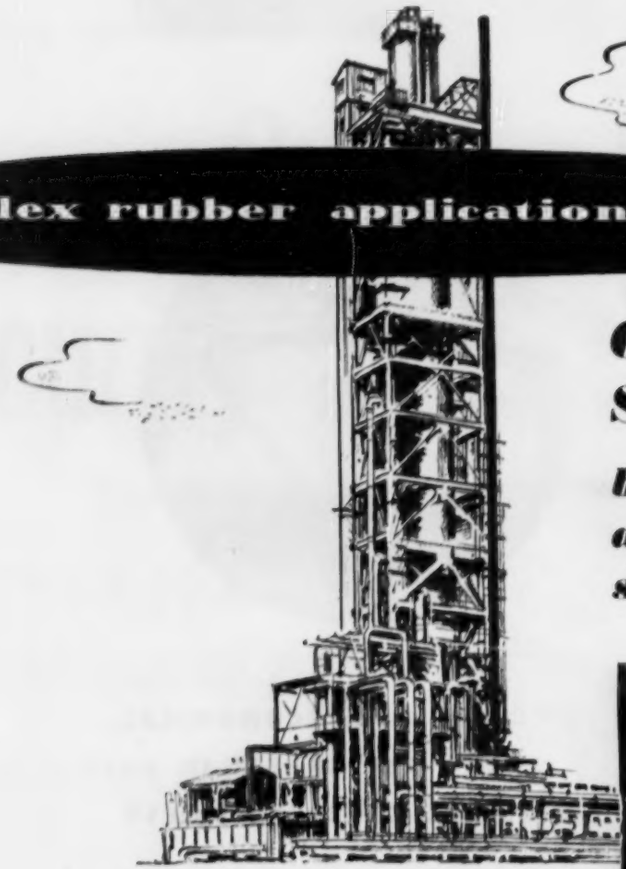


# complex rubber applications call for

# COMPLETE SERVICE

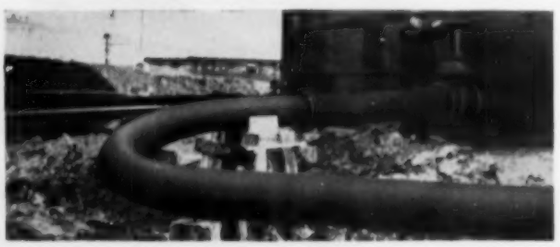
## before and after supply

In the world's oil production centres Dunlop Industrial Rubber Goods have earned preference — and not merely for their consistent success in the many vital functions they fulfil.

Oil men know that Dunlop backs its rubber equipment and accessories with knowledgeable staff and technological resources built up over years of association with this industry. When problems confront them, Dunlop's experience gained through practical precedent is at their disposal; a service to be called upon before and after Dunlop has supplied the appropriate product for the job.

Dunlop posts its specialists world-wide to study and advise on installations, operations and maintenance. If you have problems involving any product illustrated or listed on this page, contact your Dunlop representative or distributor. Or, seek guidance direct from the headquarters of the organisation with the most profound knowledge of conditions in every industry today. This technical service is entirely free and without obligation to you.

S.S. "Velutina" of the new Shell Fleet, loading crude oil with Dunlop Cliplesstype sea-loading hose. This hose incorporates high-quality, hard-wearing oil-resistant synthetic rubber compounds and internal wire reinforcement and can handle many tons of crude oil per hour during a long and efficient service-life.



Dunlop Oil Suction and Discharge Hose bridging the gap between pipe line and storage tank. This type incorporates high-quality, hard-wearing, oil-resistant synthetic rubber compounds, and is suitable for the severest conditions.

Dunlop Oil Suction and Discharge Hose to British Standard Specification 1435 Type 3. This 5" bore hose is suitable for use at working pressures up to 200 lb./sq. in. Photograph shows the hose at one stage of the rigorous testing programme to which every length is subjected.

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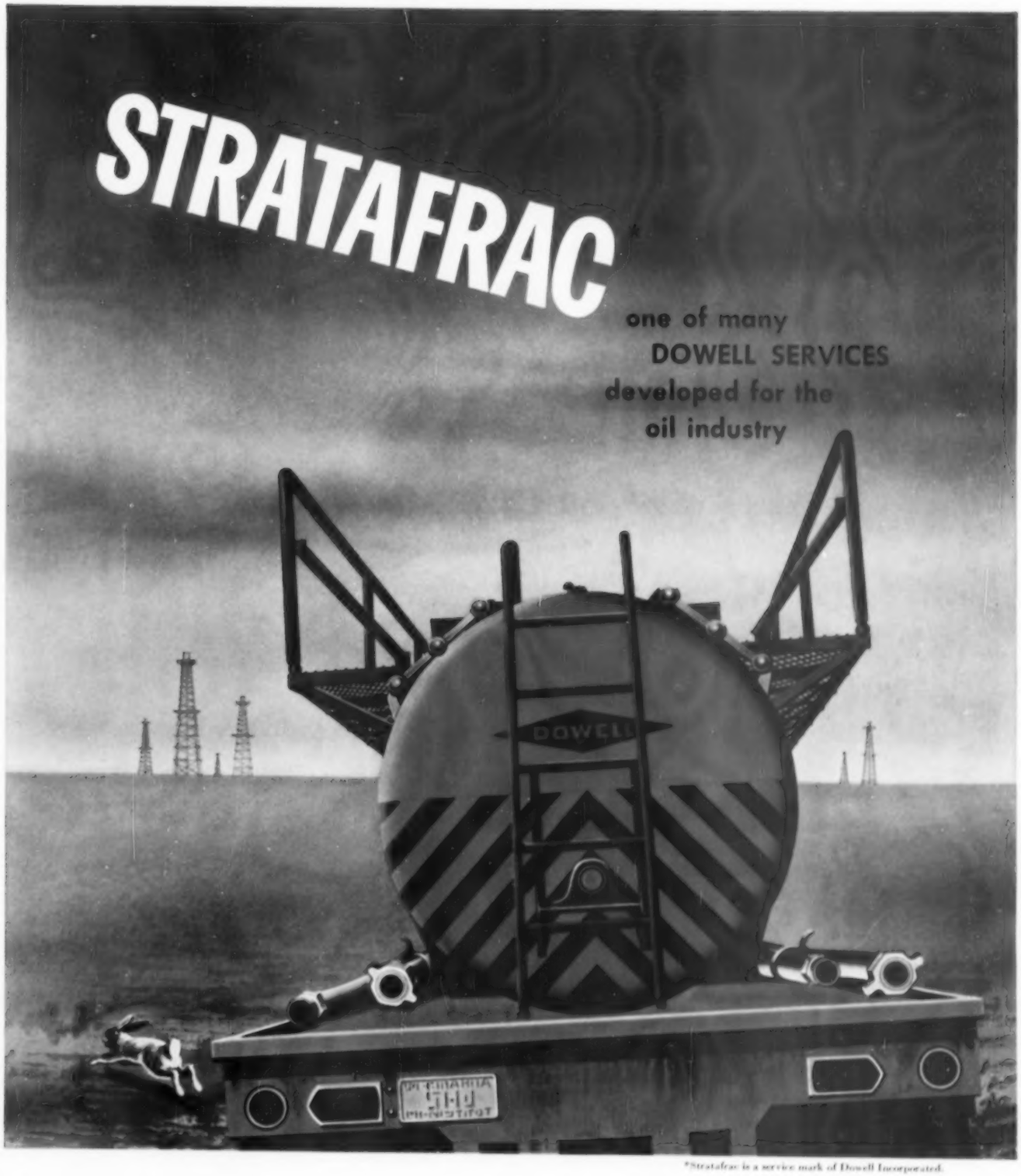


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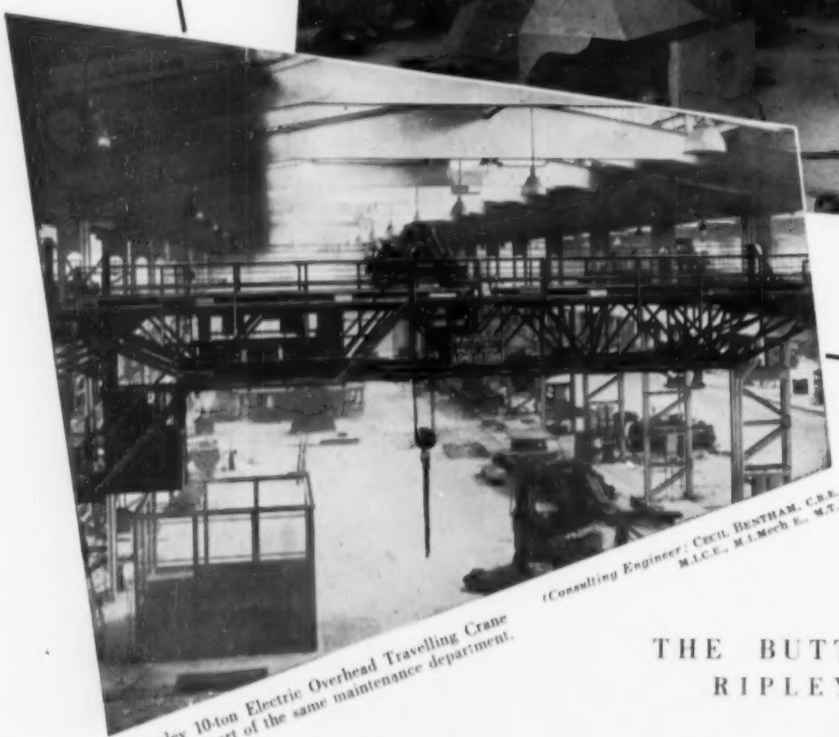
# by BUTTERLEY

30 ton Butterley Electric Overhead Travelling Crane installed in the maintenance department of an important steel works.



Butterley 10-ton Electric Overhead Travelling Crane in another part of the same maintenance department.

(Consulting Engineer: CECIL BENTHAM, C.B.E., M.I.C.E., M.I.Mech.E., M.T.)

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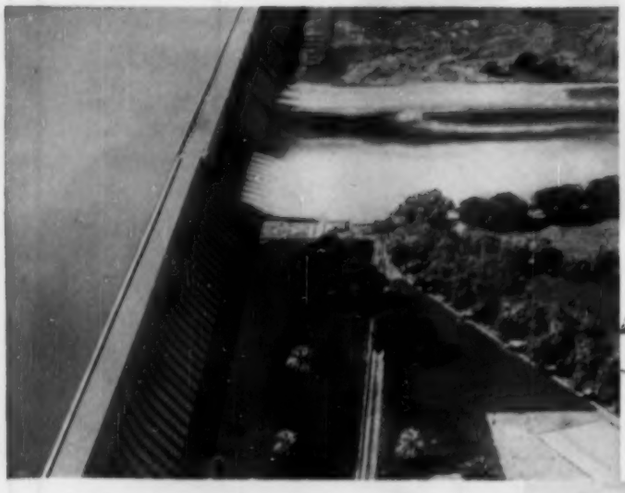

**EGYPT** — For more than half a century, the Nile's gigantic Asswan Dam has been the key point in Egypt's vast irrigation system. Now, engineers are installing a powerful hydroelectric plant in this dam. Cheap electricity from the plant will aid agriculture and heavy industry . . . will benefit all Egypt. Caltex lubricants and fuels are used for all construction equipment in this new project to harness the power of the Nile.

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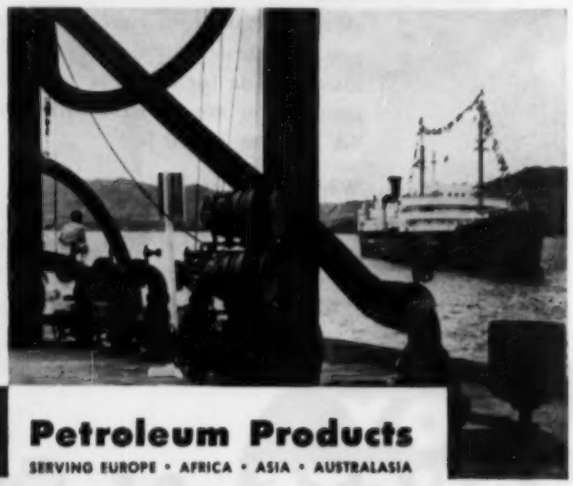
IN 67 lands, across half the world, through such developments as these, Caltex is able to supply better fuels and lubricants for industry, for agriculture, and for motoring millions. These require a continual investment of funds and skills, backed by a faith in a better future for free nations.



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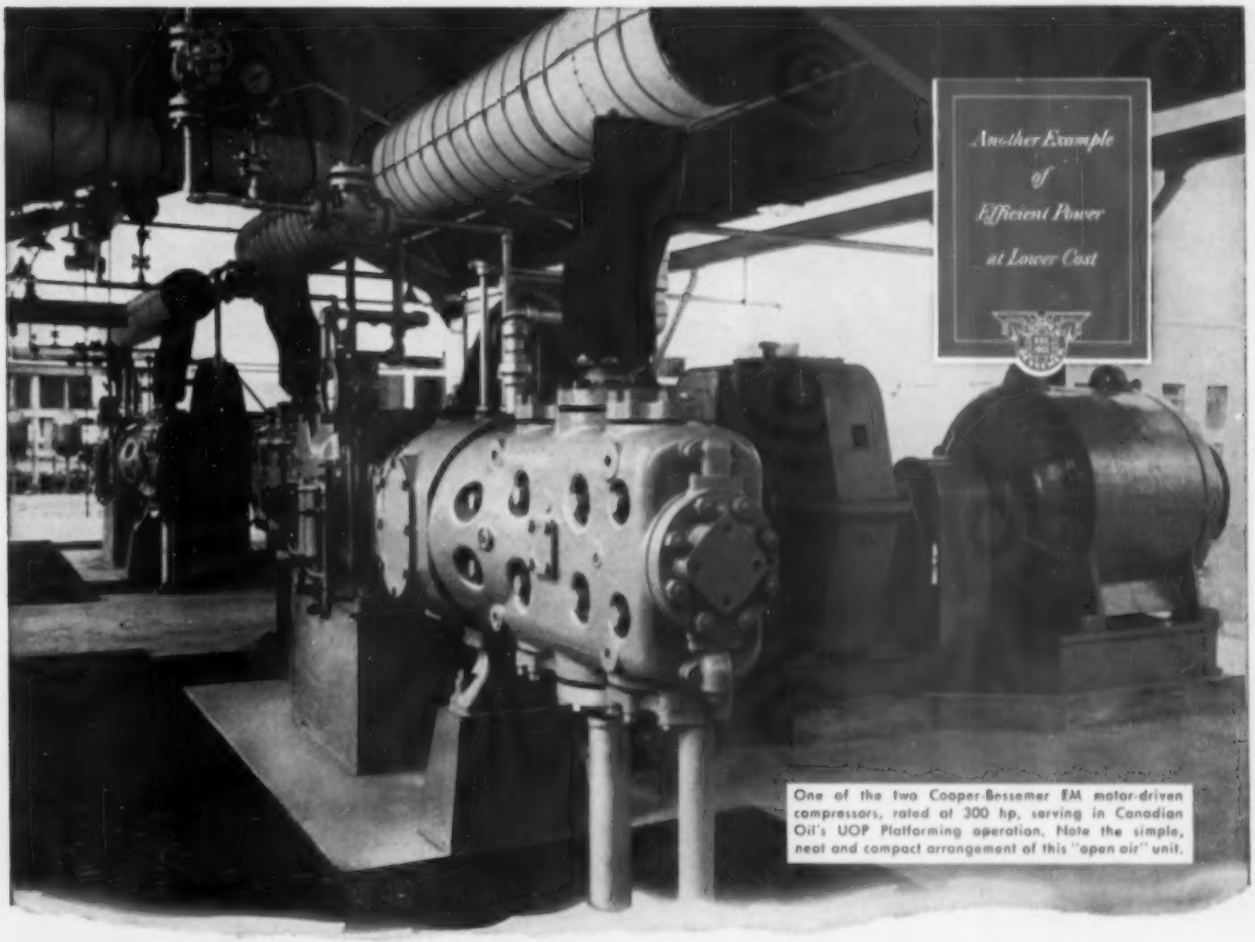


One of the two Cooper-Bessemer EM motor-driven compressors, rated at 300 hp, serving in Canadian Oil's UOP Platforming operation. Note the simple, neat and compact arrangement of this "open air" unit.

# *With* CANADIAN OIL'S PLATFORMING UNIT... *a new high in compressor efficiency for high octane gasoline*

COOPER-BESSEMER 2-cylinder motor-driven M-Line compressors efficiently recycle hydrogen for the UOP Platforming unit in the Sarnia, Ontario, refinery of Canadian Oil Refineries, Ltd.

Cooper-Bessemer developed compressors with non-lubricated cylinders have permitted Canadian Oil Refineries to run its Platforming unit thousands of hours without any possibility of contaminating the recycle gas with lubricating oil.

Canadian Oil's Platformer is charging nearly 3800 barrels per stream day, and producing high yields of gasoline with an octane number reaching well into the 90's. In this process, Cooper-Bessemer EM's continue to play a vital and dependable role in the production of high octane gasoline.

If you are considering UOP Platforming, or compressor additions of virtually any type, Cooper-Bessemer offers more than a century of reliable compressor building experience. Contact our nearest office for detailed information.

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# British Petroleum

**NEIGHBOR**—*Only 17 miles from Kwinana is Fremantle, main port of Western Australia—a city which will grow as Kwinana grows.*

AS ENGINEERS and prime contractor for the Kwinana refinery in Western Australia, The M. W. Kellogg Company and Kellogg International Corporation are justifiably proud of their latest contribution to British Petroleum Company's global operations. But the opportunity to design and build this vast undertaking is attributable to the foresight of British Petroleum and the faith it has in Australia and especially the future of Western Australia.

We salute those who conceived Kwinana, as well as the various government authorities whose help made possible this important aid to the economy of Australia. With Kwinana in operation, this refinery alone is expected to meet well over 50% of the continent's requirements for refined petroleum products and, with existing refinery facilities, soon make Australia self-sufficient in this respect.

Full credit must be given also to Costain-John Brown, Kinnear Moodie, and D. & C. & Wm. Press, Ltd.—the British consortium known as the Kwinana Construction Group—and the Australian sub-contractors. These firms all cooperated with Kellogg International Corporation to build the Kwinana refinery.

---

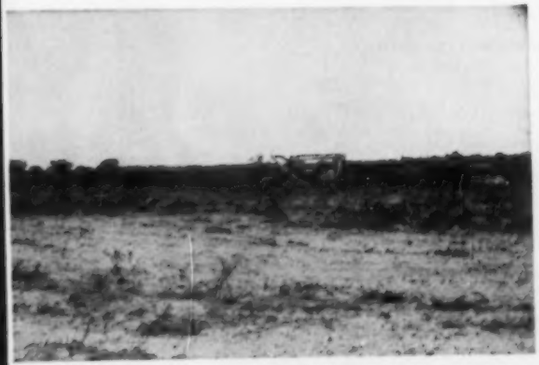
To the thousands of men who participated in getting Kwinana on stream ahead of schedule, the M. W. Kellogg Company says "many thanks for a job well done".

**THE M. W. KELLOGG COMPANY, NEW YORK 7, N. Y.**
**KELLOGG INTERNATIONAL CORPORATION, LONDON**
**Subsidiaries of Pullman Incorporated**

**THE NEW**—*One town born of Kwinana is Medina. Photograph shows houses as they were being erected for workers at the refinery.*

**THE OLD**—*Perth, capital of Western Australia, not far from Kwinana, already benefits from its new neighbor.*

# helps a Continent grow

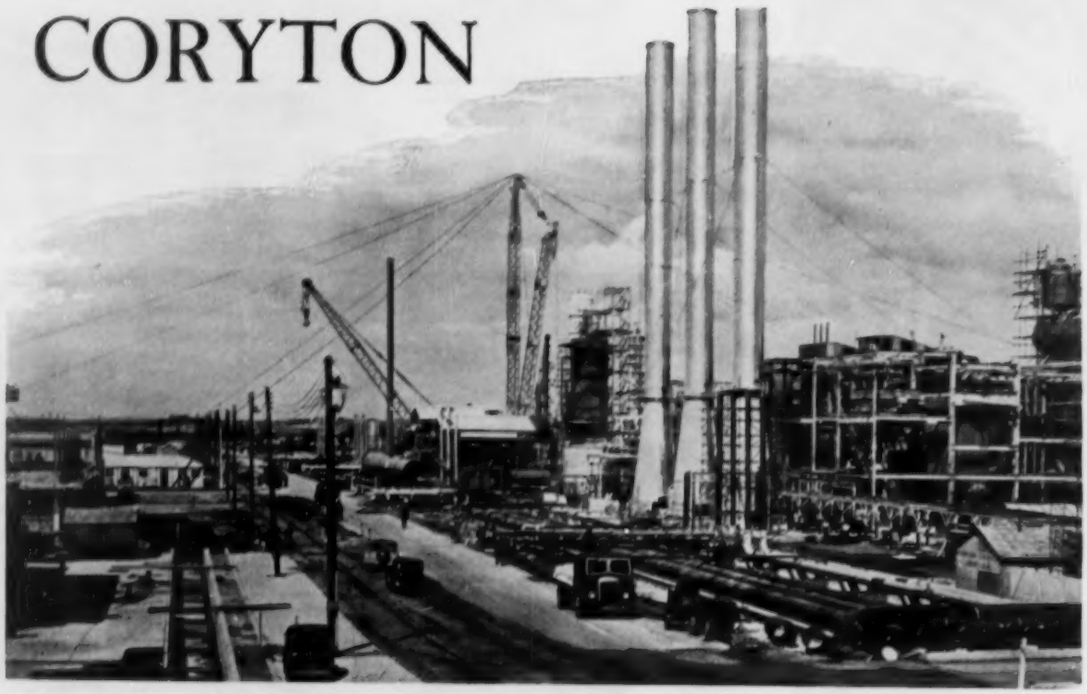


**BEFORE**—*This was Kwinana about two years ago.*

**TODAY**—*Lights twinkle at Kwinana as the refinery goes on stream at the rate of 22,000,000 U. S. barrels annually.*

FEBRUARY, 1955

# CORYTON



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**Flameproof motors** The M-V motors at Coryton include ten horizontal flameproof 2960 r.p.m. machines—four rated at 350 hp for the Propane De-asphalting plant, two at 200 hp for the Furfural unit and four at 200 hp for the M.E.K. plant. All these motors have ball and roller bearings with forced-feed oil lubrication from a gear-driven pump.

**Non-Flameproof motors** Two Metrovick 200 hp, 740 r.p.m., vertical motors were supplied for driving water pumps.
These motors (both flameproof and non-flameproof types) are squirrel-cage induction machines connected to a 3.3 kV three phase, 50 cycle supply.

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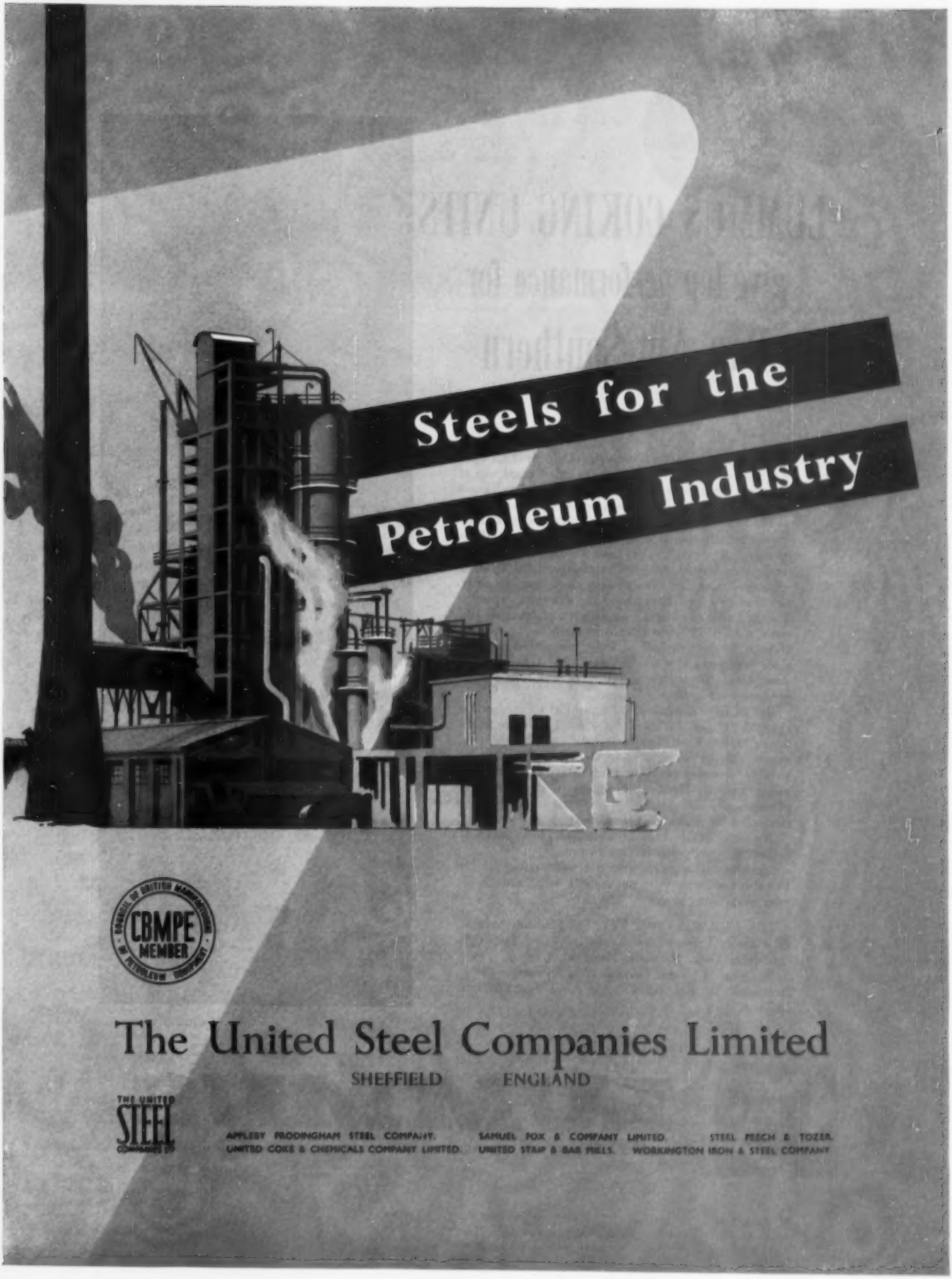
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The new (and similar) Destrehan installation is achieving equally satisfactory records.

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DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

VOL. 26, NO. 2, FEBRUARY, 1955

# World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

FOUNDED BY RUSSELL PALMER

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THIS MONTH'S COVER

Night view of the Buffalo, N.Y. refinery of Socony-Vacuum Oil Co., Inc. Color photograph by Edward Gray. Color plates are reproduced through the courtesy of the editors of *The Flying Red Horse*, Socony-Vacuum house magazine.

## NEW SUCCESSOR TO THE SACK

On the scrap heap of history is a stack of old cement sacks . . . tossed there fifteen years ago when Halliburton originated Bulk Cementing. This major improvement plugged many holes in the sack cementing method. It required a lot of special equipment like this big pneumatic trailer, but the benefits were worth it. Bulk Cementing eliminates the time-consuming labor of handling and dumping hundreds of sacks . . . it completely wipes out waste for there's no way cement can spoil, and any left over can be turned back for credit. More important, custom made cements are mechanically mixed with greater accuracy and more thorough blending of additives. When you're looking for ways to plug holes in your operating costs, take a close look at the benefits of Bulk Cementing. One of Halliburton's 45 Bulk Cement stations is near you.

**HALLIBURTON** OIL WELL CEMENTING COMPANY
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# A twenty-five-year retrospect

THIS MONTH of February marks the twenty-fifth year of publication for WORLD PETROLEUM. Such anniversaries are conventionally recognized as suitable observation posts from which to measure the progress of the past or to speculate on the outlook for the future. In this instance such a survey is of special interest because it so happens that 1930 was in certain important respects a turning point in the development of the petroleum industry.

Our older readers do not need to be reminded that 1930 was a dark year for business in general and a particularly bleak period for oil. The greatest depression of modern times was spreading its deepening shadows over the globe. The consumption of petroleum products which had been growing in the United States at the rate of 16 percent during the decade then ending, dropped below five percent in 1930. Along with this slackening in the growth of demand, American consumers were called upon to absorb a tremendous increase in production through the bringing in during the mid-twenties of great flush fields in the Midcontinent to be followed in 1930 by the outpouring of East Texas, up to that time the greatest flood of oil ever to be loosed. The story has often been told of this disheartening period when the price of crude oil fell as low as ten to fifteen cents a barrel and only the firm stand of Texas for a system of conservation averted complete chaos.

Dark as was the prospect at this juncture, it did not discourage a young man out of the West, not then forty, who had built up a flourishing group of industrial journals in New York that had been taken over by a large publishing combination at what had been named as a prohibitive price in the booming days of the late twenties. Thus, suddenly, he faced the alternative of doing nothing or making a fresh start in some other part of the publishing field that appealed to him.

The young man's name was Russell Palmer. He had no liking for a life of idleness and besides he had an ambition which he now felt he was in a position to gratify. This was to establish an entirely new kind of industrial magazine in a field of world dimensions and built along lines novel to the business press.

The field was not difficult to choose, for he had long been intrigued by oil, which he regarded as a commodity of global utility and destined to become the world's prime source of energy. The fact that the industry at the moment was in the doldrums he dismissed as a passing phase, arguing that the potential applications and obvious advantages of petroleum were so numerous that the demand for it would multiply over and over again and that any halt in its growth would be of brief duration. He correctly diagnosed the depression as one that would pass its crest by its fourth year and held that, since any new magazine must pass through a period of trial, a time of dullness was as good as any other for that test.

As to the kind of magazine he wanted to father, Mr. Palmer had equally definite ideas. Because a publication was devoted to business subjects, he held, was no reason why it should not be attractive to the eye. Technical subjects could be treated in terms understandable to others than scientists or mathematicians. A magazine, like an individual, must have a character of its own, must express its views without equivocation and must seek always the highest interests of the industry it elects to serve.

Above all, Mr. Palmer realized clearly the essentially international character of petroleum. A commodity of such value to mankind, he felt, should not be hinged about with restrictions, but should be made as widely available as possible. Monopolies, obstructive trade barriers and systems of taxation that hampered use were indefensible, in his opinion.

Out of these ideas and ideals came WORLD PETROLEUM, a magazine attractive to the eye, carefully edited to present its information in concise form for busy men, faithfully chronicling the technical progress of the industry and fighting unceasingly for its freedom from the paralyzing hand of governmental management.

It did not take WORLD PETROLEUM long to find the place that Russell Palmer had planned for it in the oil industry, and before his untimely death in his fiftieth year, he had the satisfaction of seeing his early dream transformed into reality and his ideas regarding concise reporting, typographical excellence and attractive dress widely adopted by trade and technical journals of this and other businesses.

# Creole dedicates Tia Juana

Creole Petroleum Corp. dedicated a $20-million repressuring plant in the Tia Juana field in Lake Maracaibo, Venezuela on January 15, culminating a four-year planning and building program. The plant is the first large repressuring installation in the Bolivar Coastal fields and is unique in that it is built on piles 80 feet above the bed of the lake, is seven miles offshore and because much of the equipment is new in design and capacity.

H. W. Haight, Creole president, announced in an address to government and oil industry leaders at the dedication ceremonies that the Tia Juana plant is the first of a series which the company plans to erect. Eventually the company expects to utilize 80 percent of its gas production for repressuring or fuel.

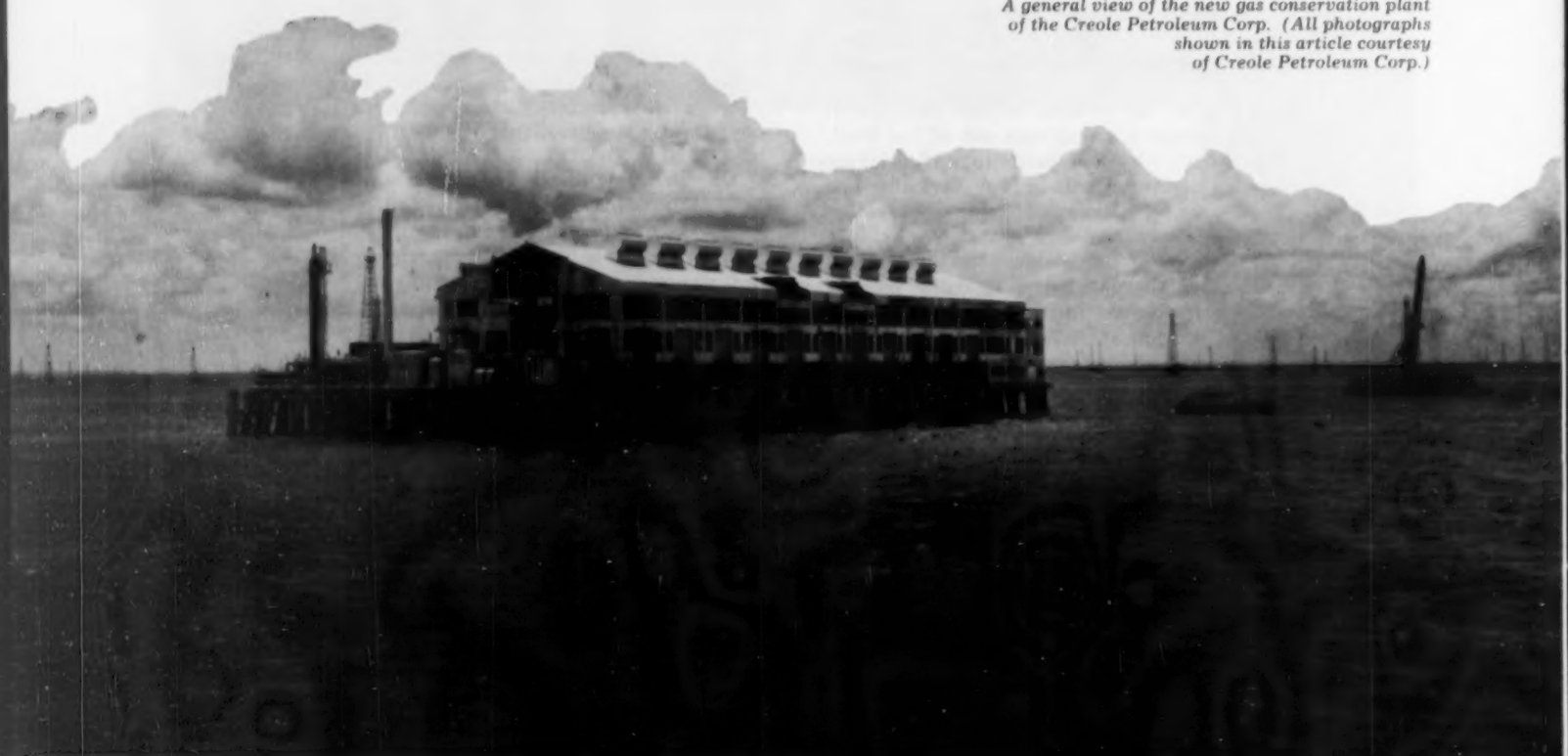
Erection of the plant at an offshore location was made possible by extended technical studies and by recent developments in equipment designed to minimize vibration. Compressors utilized are gas turbine-driven centrifugals capable of compressing gas to 2,000 psi, a pressure range never before reached in centrifugal compressors. A total of 60,000 turbine horsepower has been installed to inject 137 million cubic feet of gas daily into the producing horizon.

Creole, in common with other oil companies, has been active in the erection of repressuring plants for many years in Venezuela at onshore locations in fields where structural conditions appeared favorable. Some of the very early experimental installations begun more than 20 years ago were not successful due to low structural relief, but the industry has been diligent in its studies of the subject and has invested many millions of dollars in research and development. Results will be evident over the long run in increased ultimate recovery. Creole, for example, will be able to increase net oil production of the Tia Juana field about 30 percent before the exhaustion point is reached.

In Eastern Venezuela pressure maintenance operations were first undertaken about 15 years ago. At present there are a large number of field plants operating in this area including gas injection and water injection units.

In Western Venezuela there are only two repressuring plants in operation, the new Tia Juana unit and a smaller installation in the Cumarebo field on the north coast near the Paraguana Peninsula. The Cumarebo plant injects about 1.5 million cubic feet of gas daily into the producing horizon. Activation of Tia

*A general view of the new gas conservation plant of the Creole Petroleum Corp. (All photographs shown in this article courtesy of Creole Petroleum Corp.)*



# conservation plant

Juana increases gas injection nearly tenfold. An attempt to repressure Lake Maracaibo fields was made several years ago, but without success. The earlier plant also was built on piling in the lake. Motor driven reciprocal compressors were used.

The Eocene sand reservoir in the Tia Juana field which is being repressured was discovered by Creole in 1939 at a depth of about 5,250 ft below the surface of the lake.

The discovery well was drilled about three miles from the nearest production at that time and was the first test to penetrate the Eocene in that part of the Bolivar Coastal area. Original formation pressure was about 2,590 psi, and this had fallen only to about 1,740 psi at the end of 1951 after the field had produced 140 million barrels. This had increased to 197,500,000 barrels at the end of last September at the time repressuring was begun. Formation conditions are such that the wells could be produced efficiently at a rate of about 1,200 b/d. The producing horizon has a thickness of nearly 200 feet and an aerial extent of about 9,800 acres. Crude is asphaltic in character and varies from 18 gravity at the bottom to 28 gravity at the top of the formation.

Following discovery of the field in 1939, one was drilled in 1940 and five in 1941. Since that time development was steady until the field was outlined.

The repressuring project is designed to gather a total of 154 million cubic feet of gas daily from the producing wells in the LL-370 area. From eight nearby flow stations, where the gas is separated from newly produced oil, it is carried to the new plant through five 30-inch pipe lines at a pressure of 25 psig.

Of the total volume gathered each day, it was estimated that some 17 million cubic feet would be burned as fuel and condensed to liquids. The remaining 137 million cubic feet would be compressed to 1,935 psig and returned through five injection wells to the producing formation.

The pre-design study indicated that the gathering of the gas to a gas combustion-turbine powered centrifugal compressor station, in the weighted center of the field, was preferable on all counts. The decision to use such a system was quite progressive since experience with gas-fired combustion turbines was limited, and at the time no large installation of centrifugal compressors had been made for compressing natural gas above 1,000 psig. On the basis of the studies, the project was held to be feasible and economically attractive.

The installation of a gathering system to handle large volumes of gas at low pressures was one of the unique problems that had to be overcome. The gathering system lies on the lake floor at depths of from 62 to 65 feet. Based on optimum pressure drop, it was determined that the economic line sizes should range from 24 to 30 inches in diameter. Some 65,000 feet of 24-inch, 26-inch and 30-inch pipe were actually laid. Protection of the pipe against the corrosive effect of the brackish lake water and the teredos (marine termites) that exist there, plus the necessity for added weight to secure a negative buoyancy, required special preparations. The system devised was to coat the pipe with asphalt, wrap it with glass cloth and then with heavy wire mesh, and then to cast some 4½ inches of concrete around it. This provided an average negative buoyancy of about 15 percent. The preparation and placing of this extremely heavy pipe (562 pounds per lineal foot for 30-inch pipe in sections up to one mile in length) in 62-65 feet of water was in itself a major undertaking.

The fact that lines of such large diameter could not successfully be cleaned by flowing, that the interior pressure of the gas would be less than the exterior water pressure—with the consequent entrance of water on development of breaks or leaks—and the impracticability of installing and operating "line drips," required extensive measures to prevent the entrance of liquids into the gathering lines, and to remove such liquids when inadvertently admitted.

The compressor plant consists of ten General Electric, 6,000-hp, two-shaft gas turbines each direct-connected to ten specially designed and constructed Ingersoll-Rand centrifugal compressors.

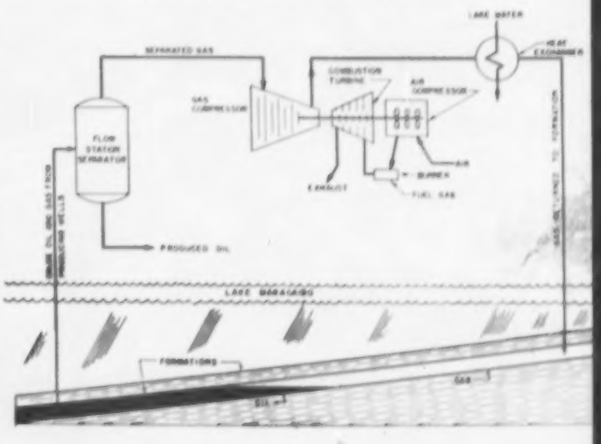
Seven stages of compression are provided. The first stage requires the capacity of three compressors connected in parallel to handle the large gas volume at the low plant intake pressure (25 psig). Two parallel-connected compressors form the second stage, while the remaining stages have one compressor each. Intercooling and interstage condensate facilities are provided between each of the stages. Provision is made for the interstage condensate to be stabilized and pumped to the nearest flow station for blending with crude. Prior to delivery to the injection lines, the seventh stage discharge is cooled. Any entrained or condensed water is removed at this point to lessen corrosion which might result from combination of the water with carbon dioxide contained in the gas, and to prevent slugs of water from returning to the formation.

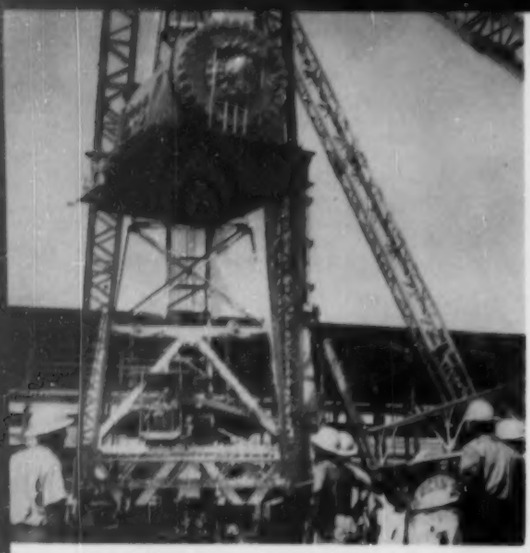
The ten two-shaft turbine drivers, selected to secure maximum flexibility in speed variation, represent the largest concentration of gas combustion turbines in the world. The turbine air compressor will operate at 7,500 rpm and the power rotor normally at 5,400 rpm, with "overspeed trip" at 6,000 rpm.

The first three compressors are cast iron horizontally split type, the next three are cast steel horizontally split type, and the last four are forged steel vertically split barrel type. Any single turbine-compressor unit can be isolated from the system without shutting down the plant. The estimated decrease in throughput with a compressor out of service will vary from eight percent for a first stage compressor to some 25 percent for a sixth or seventh stage compressor.

The complex control equipment of the plant is designed to take care of the multiplicity of coordinated and interlocking steps required to start and operate its high-speed machinery, to protect

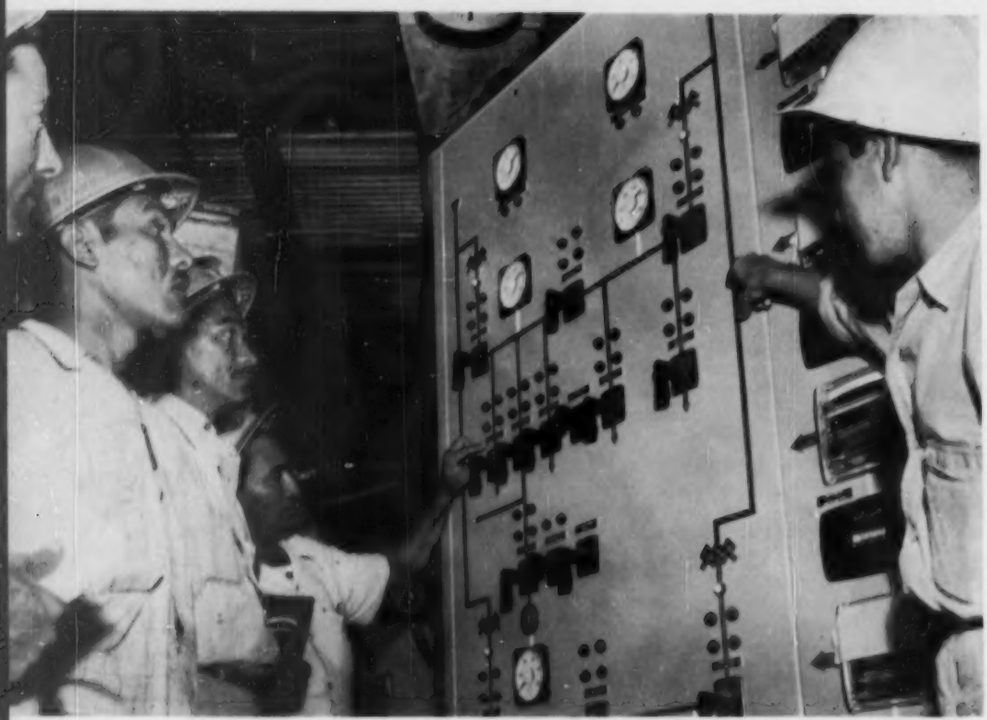
A SCHEMATIC DIAGRAM
OF
PRESSURE MAINTENANCE PLANT



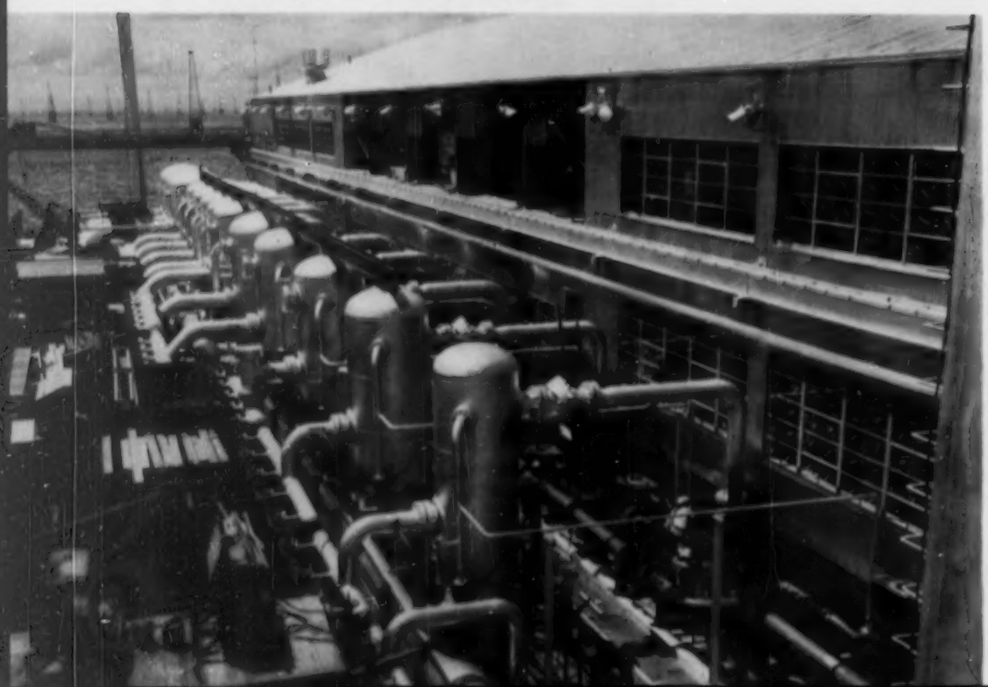


*One of the ten centrifugal compressors installed in the plant is swung into position during construction.*

*Master control panel used to operate Creole's gas conservation plant is explained to workers being given special training. The complex panel is of the graphic type and pictures the flow of gas through the plant.*



*Scrubbers through which the gas passes before entering each successive stage in the compression process.*



each compressor from surge conditions, to isolate immediately a faulty turbine-compressor unit from the system and to secure a maximum of safety. Three of the four major control systems work in conjunction with each other in interacting and/or overriding manner, while the fourth is a three-way pressure relief system. Aided by this extensive instrumentation, the compression system will permit operation of the plant with a minimum of personnel and greatly reduced maintenance costs, when compared with a conventional reciprocator-type plant. One of the largest savings foreseen is in the decreased use of lubricating oil.

Gas turbines of the type installed by Creole have now been thoroughly tested in commercial operation for a number of years. General Electric Co. was a pioneer in the development of this type of prime mover and thus far has shipped more than 100 units. Of these, 53 are in the petroleum industry.

One of the early installations was for an El Paso Natural Gas Co. pipe line pumping station engaged in compressing gas for transmission to California. The first El Paso station began operations in September 1952.

Creole's plant is well equipped with an instrument shop, a mechanical maintenance shop for small work, six offices, change-shower rooms and a dining room. Communication with the shore is by radio-telephone and through the plant itself by an inter-com system.

The productive horizon into which gas will be injected is a permeable rock slab saturated with oil and above 200 feet thick, consisting of 85 percent sandstone and 15 percent shale. The top of the oil reservoir, at 4,500 feet below the lake surface, is sealed off by the Miocene-Eocene unconformity and the bottom is bounded by immobile edgewater at 5,850 feet. Two large faults define the side boundaries. The structure dips a gentle three degrees to the southeast and the total productive area involved is approximately 9,800 acres.

This deposit is similar to all major oil accumulations in the Bolivar Coastal Field in two characteristics: (1) it has no active water influx at the bottom, and (2) it originally had no gas cap at the top. Production during the early years was entirely by solution gas drive. By 1950, a secondary gas cap formed by gravitational segregation had reached the structurally highest wells. It was apparent that even without artificial pressure maintenance, considerable increases in oil recovery above that to be expected by dissolved gas drive could be obtained by assisting the gravitational segregation and secondary gas cap development. In short, the reservoir was performing efficiently as a natural gas oil system except for the declining pressure and accompanying undesirable changes in fluid properties.

During the development of the reser-

voir, the importance of obtaining cores from the productive formation was recognized, and in many wells cores were obtained throughout the productive interval. Characteristics of porosity, permeability and fluid saturation were determined. All properties of the reservoir fluids were checked to obtain accurate data on the oil characteristics. Analysis of all this information was the initial step undertaken by Creole four years ago. In view of the complicated reservoir calculations involved and variations in the producing sand's characteristics and fluid content, estimation of the recoverable oil under various development programs required ten man-years of work.

Behavior of the deposit in future years was estimated under three different conditions: (1) production by natural forces, (2) production by pressure maintenance with gas injection, and (3) production by pressure maintenance with water injection. Gas injection was decided on as the most advantageous.

As a result of the operation of the new plant, the following major benefits are expected:

1. The wells in the area will continue to produce by natural flow.
2. A large volume of gas will be conserved.
3. Producing rates of the field will be increased by nearly one-half.
4. The amount of oil recovered from the reservoir will be increased by about one-third.

Construction of the plant proper was begun in August 1953, after the platform had been erected upon foundations driven into the lake bed. These foundations consisted of reinforced concrete piles, 28 inches square and 165 feet long. The piles were pre-fabricated at Creole's casting yard on shore. They represented a substantial saving over the caisson-type piles previously used in water of this depth. A total of 350 piles supports the platform, which is 329 feet long and 143 feet wide. The platform stands 14 feet above the water and some 80 feet above the lake bed. In areas required to support concentrated weight, the piles were driven to "no go" with the application of 200 tons of weight. A minimum of 72 tons was applied to piles in less critical areas.

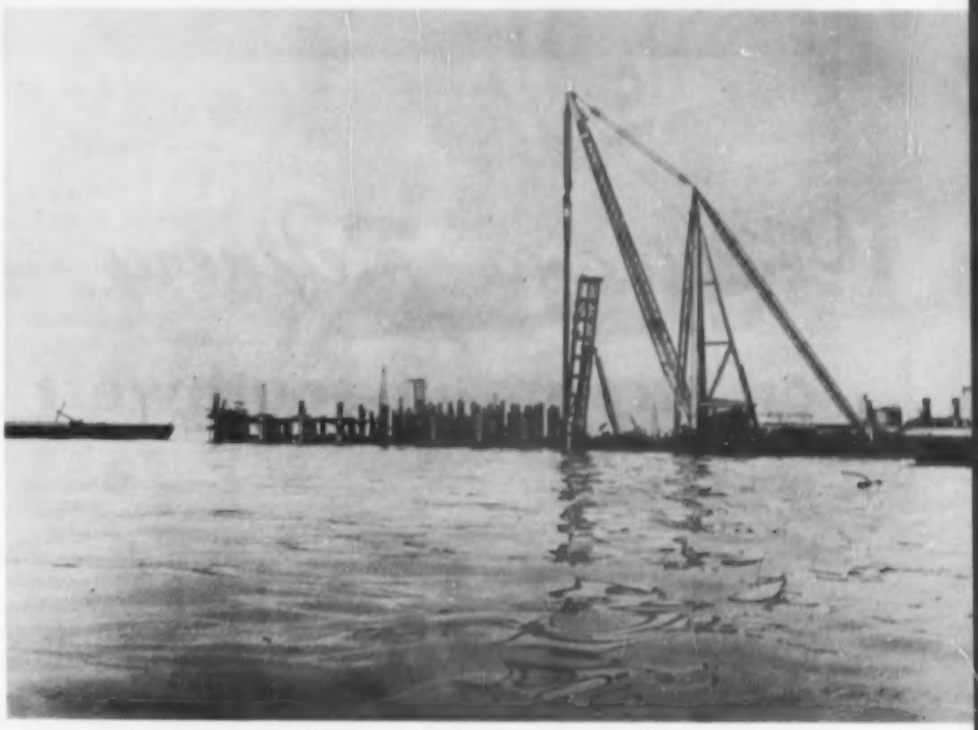
Pre-casting on shore of the beams, floor sections and the ten turbine-compressor support boxes (130 tons each), and the subsequent integration of these into the platform resulted in savings of materials and construction time.

The platform design called for maximum economy of space.

Construction work at the plant was completed in August 1954, and the first trail operations were effected in late September. In October, injection of gas was started.

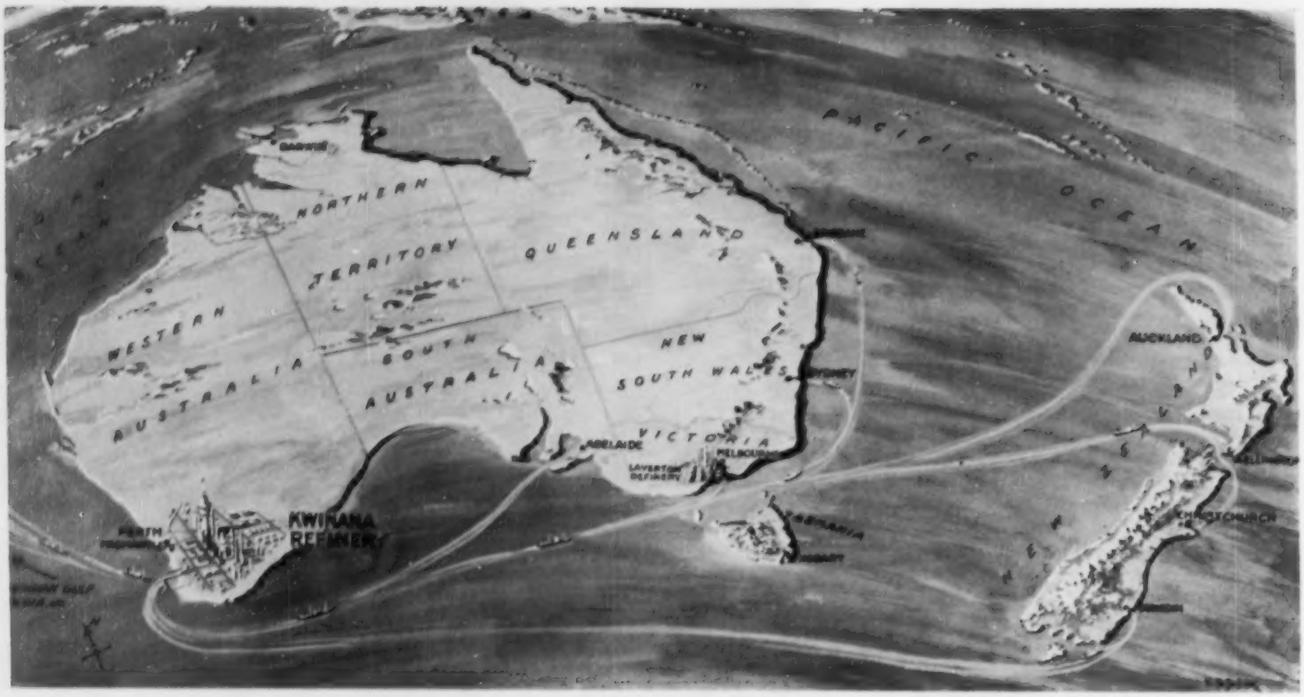
Transportation of plant personnel is handled by diesel-powered launches operating from Creole's shore installations.

*Compressors build a discharge pressure of 1,935 pounds in a series of seven successive stages. There are three parallel compressors in the second stage and single units for the remaining five stages so that there are ten units in all.*



*Early stage of construction work on the Creole gas conservation plant called for the placement of 350 concrete piles, on which the platform and plant itself rest.*

*After piles have been fixed in lake bed, they are trimmed off "to size." Workers use torches to cut reinforcing rods and shear off pile itself with pneumatic chisels.*




# *Kwinana Refinery*

# on stream in southwest Australia

**By E. Lawson Lomax**

BRITISH PETROLEUM CO. is beginning operations this month at its new refinery at Kwinana, Australia. The $85-million plant is the largest refinery on the Australian continent. It has a capacity of 60,000 barrels daily, a volume almost half as great as the current domestic consumption of the Commonwealth.

The refinery has been built at Cockburn Sound on a 950-acre site about 17 miles from Fremantle, chosen by refinery experts of the Anglo-Iranian Oil Co. Ltd., now British Petroleum Co. Ltd., with the assistance of Western Australian advisers, as being almost perfect for the purpose.

This site is mostly flat, only lightly covered by coastal shrub, is well above sea level and there is deep water close inshore. The ground has excellent load-bearing qualities, rendering it very suitable for the concentrated loads used in refinery construction.

Cockburn Sound, on the shore of which the site lies, has an area of about 17,000 acres which is virtually land-locked, and has been described as the best anchorage on the western coast of Australia.

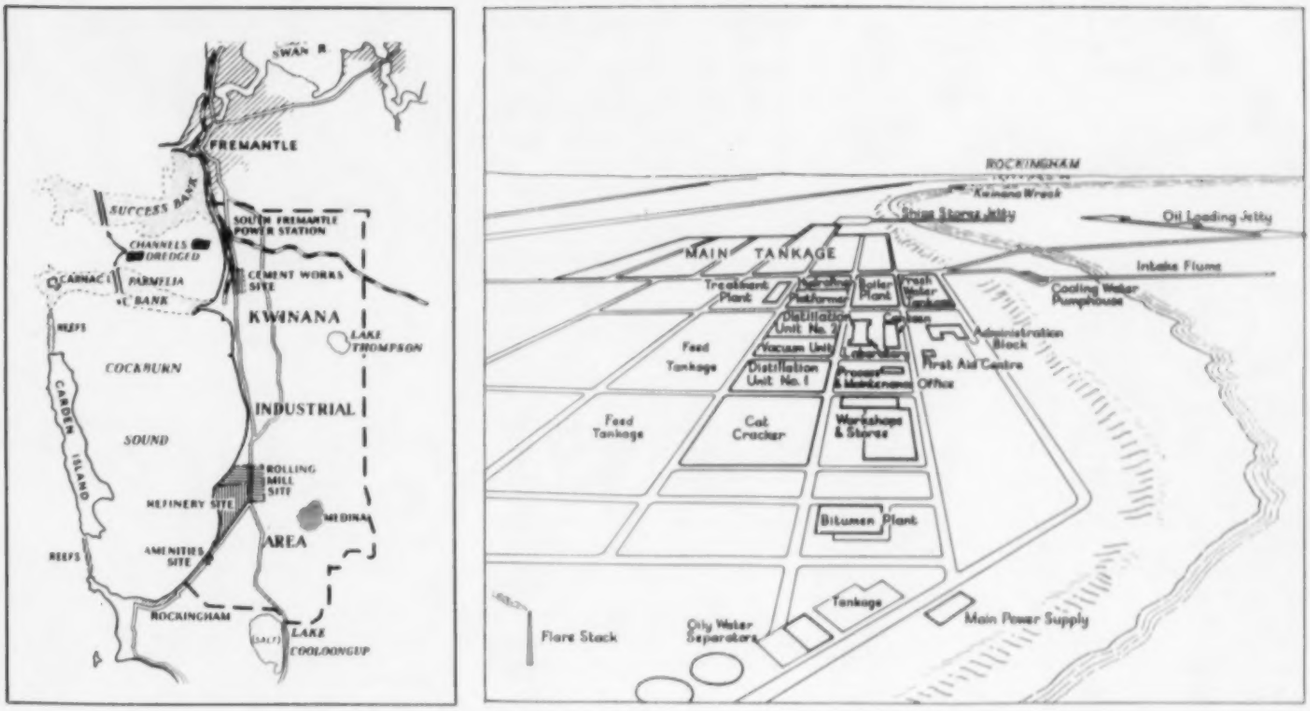
The oil port for the reception of crude oil and despatch of refined products has been developed conjointly by the Western Australia State Government and the Australasian Petroleum Refinery Ltd., an associate of the British Petroleum Co. The approach to the port will be from the Gage Roads through the Success and Parmelia sand banks. A channel was cleared through these banks during World War I, but has now to be deepened and widened for 4½ miles so that the largest tankers will have ample depth and room for manoeuvering.

This work is due for completion in 1957, but will be sufficiently advanced by the time the refinery goes on stream for standard 18,000-dwt tankers to have easy access to the jetty.

Dredging was started by two Dutch dredgers of Hollandse Anneming Maatskappy, Capetown, S.A., in January 1953, and in the first six months they removed 4,500,000 cubic yards of sand in making the 38-foot-deep and 500-yards-wide channel. The complete dredging operation calls for the removal of about 7,000,000 cubic yards of sand from the sea floor.

To expedite the landing of materials and stores for construction work, a temporary rubble jetty was built, and work on the permanent oil jetty started in June 1953. This jetty has a 1,000-foot approach running at right angles to the shore and at the end of this is a T-head, 1,700 feet long, long enough to accommodate three 32,000-dwt tankers simultaneously. It was built by the Kwinana Construction Group (Ptl) Ltd. The vertical piles for the shore arm and T-head, many over 100 feet long, were shipped in two sections from the United Kingdom and welded together on site.

Pre-cast concrete beams and slabs made on site were used for the decking for access, carrying of pipe lines and rails. Crude oil discharged from the tankers will be pumped through separate pipe lines on each jetty into crude storage, each line having a capacity of 1,000 tons per hour.




*Map at left shows situation of the new Kwinana refinery on Cockburn Sound, sketch at right the refinery layout.*

The dredging of the two sand banks at the entrance to Cockburn Sound was undertaken by the State of Western Australia, but after completion of the refinery, Australasian Petroleum Refinery Ltd. will pay a portion of the cost. In return for this payment, tankers will be exempted from the harbor and pilotage dues.

The main contractors for the refinery design are the M. W. Kellogg Co. and its British-registered subsidiary, Kellogg International Corp., in association with a consortium of British contractors composed of Costain-John Brown, Kinnear Moodie, and D. & C. & Wm. Press Ltd., who have carried out the actual construction.

The refinery is designed to process 3,000,000 tons *per annum* of Middle East crude into various types of fuel and asphalt, no lube oil manufacture being at present envisaged. The products from this processing will be about as follows:

| | TONS PER ANN. |
|---|---|
| Motor Spirit | 660,000 |
| Diesel and Gas Oil | 440,000 |
| Aviation Turbine Fuel | 120,000 |
| Power & Lamp Kerosine | 120,000 |
| Fuel Oil | 1,500,000 |

Two 35,000 b/sd atmospheric distillation units have been erected which were designed primarily to deal with crudes from Kuwait and Qatar, but are sufficiently flexible for other Persian Gulf crude such as Zubair, Iranian and Saudi Arabian which will be handled should circumstances require.

The units have flexible side stream stripping units and also a surge drum between the heat exchanger services and tower to remove, at a preselected temperature, any water present in the crude. Process stream is heated in a unit combined in the pipe still at a pressure of 25 psi.

Gaseous ammonia is introduced into the main tower overhead to prevent corrosion.

The pipe still furnaces are fitted to use forced draft, to provide for the possible future use of bitumen as fuel.

A light gasoline overhead and four side streams, i.e., naphtha, kerosine, light gas oil and heavy gas oil, are taken off and the heavy residue is steam stripped before going to storage or on to vacuum distillation.

In ordinary working, both atmospheric units are in operation, and half the heavy residue from each unit is used as feed stock for the vacuum unit. Arrangements are also available for the complete residue from either units to go to the vacuum unit, in case of shut-down of the other one.

The main towers of the units are 12 feet 6 inches I.D. x 79 feet 3 inches on the straight in the bottom section and 11 feet I.D. x 21 feet 9 inches on the upper section, which heights, along with domes and skirts, give a total height of 127 feet.

The kerosine and gas oil stripper towers are 3 feet x 38 feet. The de-butanizer tower is five feet I.D. x 73 feet 6 inches and for immediate operation takes off only overhead and bottoms, but is fitted for a butane side stream should a de-propanizer be installed later. Solutizer towers are also incorporated in this unit for treatment of the light gasoline.

The vacuum distillation unit has a capacity of 24,000 b/sd. The main tower is 21 feet I.D. x 35 feet 6 inches lower section, and 11 feet I.D. x 15 feet upper section, i.e. a total height of 50 feet 6 inches on the straight.

As mentioned before, the feed stock consists of half the residue from each crude distillation unit, and it produces a light gas oil as overhead and a heavy waxy gas oil as side stream.

In order to produce clean light gas oil as feed for the cat cracker, four de-misting pads are fitted in the tower. Vacuum is maintained by a barometric condenser and a two-stage steam ejector system. The residue is run down to penetration asphalt or to heavy residue for fuel blending as required. Adequate corrosion allowance and protection has been provided. When running to fuel residue, the bottoms are run to 3,500 secs. Redwood No. 1 viscometer at 100°F. The furnace is provided with forced draft for burning bitumen as fuel if required.

The Orthoflow catalytic cracking plant is designed to handle 12,500 b/sd fresh feed, cracking to a conversion of 53.5 percent with a single pass. The catalyst is a synthetic one composed of $SiO_2$ and $Al_2O_3$.

The cracked products consist of: fuel gas containing excess butanes with not

more than two percent pentane; light cracked gasoline 9 lbs. R.V.P. end point 300°F; heavy cracked gasoline 9 lbs. R.V.P. end point 410°F; tractor vaporizing oil end point 600°F; stripped heavy gas oil; and decanted oil, about heavy gas oil quality, containing about ½ lb. per gallon of settled-out catalyst.

Provision is also made for the future production of $C_3$-$C_4$ gas containing about one percent pentane and also a propane-butane stream containing 90 percent $C_4$'s.

The plant is the very latest type of Orthoflow cat cracker. It is the first of this latest design to be erected outside the U. S. A. and the second of any Orthoflow type to be erected in the Eastern Hemisphere.

The working of the plant is as follows: the hot fresh feed from the feed surge drum, recycle gas oil, if any, from the fractionator and hot catalyst bearing slurry from the settler, flow to the Orthoflow converter, in which the cracking reaction and catalyst regeneration takes place.

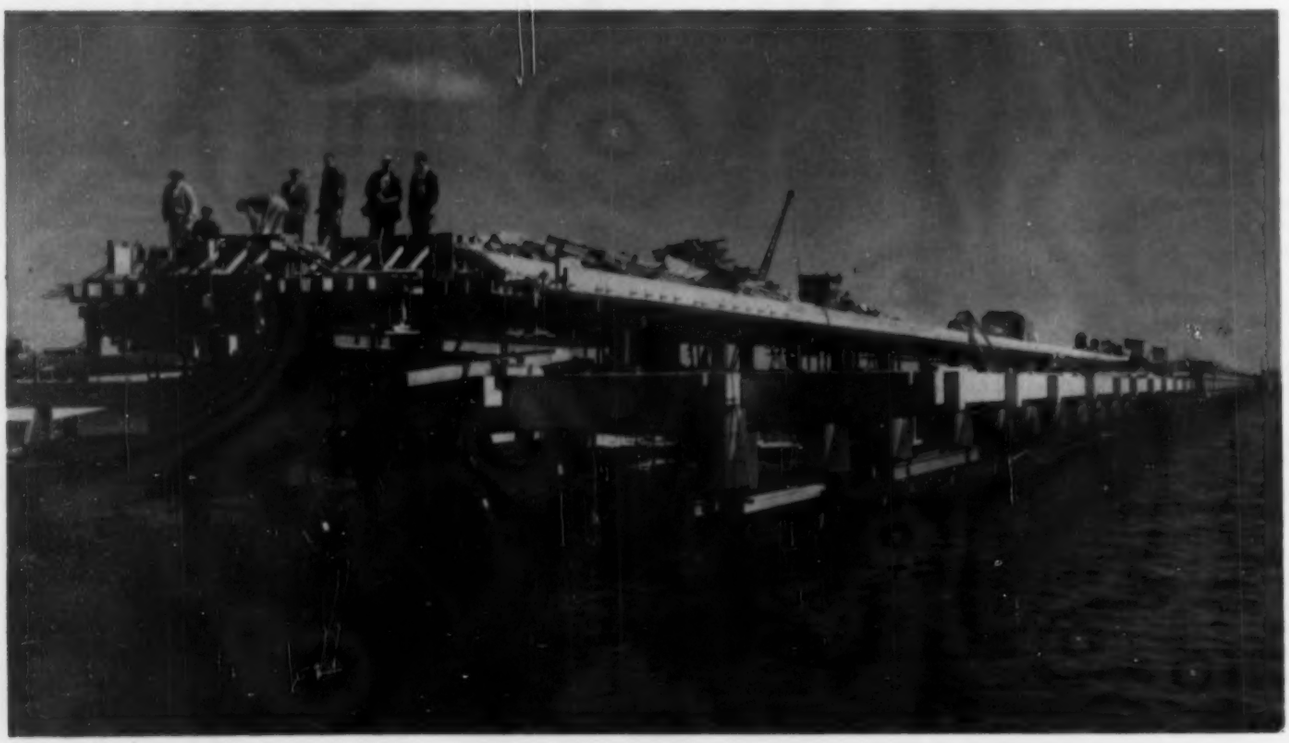
This single Orthoflow convertor contains reaction, catalyst stripping, regeneration and catalyst circulation facilities. Powdered catalyst is maintained in fluidized beds in the reactor, stripper and regenerator by upflowing vapors and is circulated from one section to another by maintaining different catalyst concentrations in the catalyst circulation lines to and from the regenerator. The upper section is the regenerator for burning off coke deposited on the catalyst during the cracking reaction.

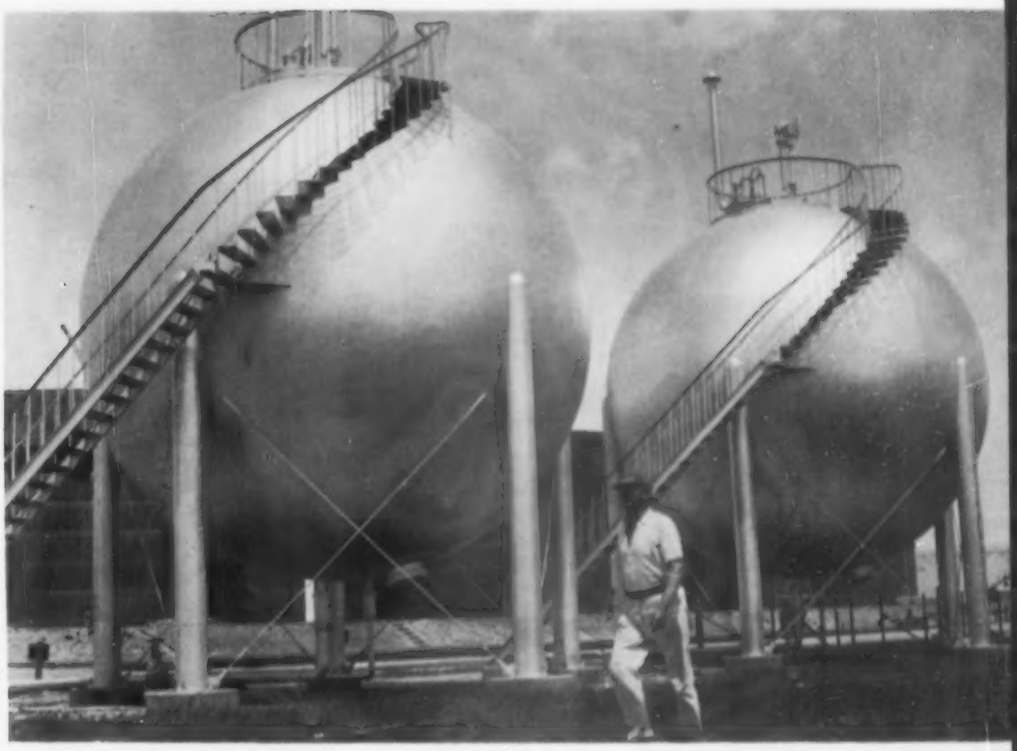
The heat liberated raises the temperature of the catalyst in the regenerator zone. Regenerated catalyst is drawn from the regenerator bed through two stand pipes fitted with plug valves and is contacted with the oil feed and a small amount of steam in the bottom of the reactor. At this point heat from the catalyst serves to vaporize the oil feed completely and raise its temperature to that required for the cracking reaction.

The catalyst and oil vapors are delivered to the bottom of the reaction chamber, the reaction section of the Orthoflow system being located directly below the regenerator; the fluidized catalyst bed depth being controlled at the level necessary to provide the contact time with the oil vapor to obtain the desired conversion. Above the fluidized bed, a disengaging space is provided for the separation of the powdered catalyst from the cracked vapors. The vapors then pass out of the reactor through single-stage cyclones to recover the catalyst which has been carried through the disengaging space.

The spent catalyst is stripped with steam in a section which is located in the lower portion of the reactor, but separated from the reactor catalyst bed by a partition. The stripping steam and stripped vapors are vented through the open top of the stripper section to the disengaging space above the reactor bed.

*Completion of the final section of the 3,000-foot main trunk way of the oil jetties, which are capable of accommodating three 32,000-ton oil tankers at one time.*





*Hortonspheres for the pressure storage of butane.*

*Pipe lines to carry crude oil from the tanker jetty and refined products for dispatch to consuming centers.*

The level of stripped spent catalyst is controlled by a plug valve, through which sufficient air is introduced to convey the catalyst upward to the regenerator. Air for the combustion of the coke deposited on the catalyst is supplied by a turbo-driven blower, through a distribution system.

The flue gases pass through a separation zone and then through three-stage cyclones, finally passing out through an acoustically lined stack to atmosphere.

At the bottom of this stack are control valves to control the pressure in the system, which consist of slide valves taking 50 percent and orifice plates taking the other 50 percent of the flow. Indirect air heaters for starting up are fired by oil gas.

Regenerated catalyst is returned to the reaction zone at the required rate to maintain cracking to the required percentage. Catalyst consumption is four tons per day, and a six-month supply is maintained in warehouse and two drums. A used catalyst drum is incorporated in the plant with sufficient capacity to hold all catalyst in circulation, and is mainly used during shut-downs.

The regenerator section of the unit is 26 feet 4 inches I.D. with a refractory lining and a height on the straight of 63 feet 9 inches, while the reactor section is 16 feet 4 inches I.D. and a height on the straight of 50 feet 6 inches, the total height overall being just over 124 feet.

The main fractionating tower is 11 feet I.D. by 77 feet high. The de-butanizer tower is 5 feet I.D. by 85 feet 6 inches high, the re-run tower is 6 feet 6 inches I.D. by 63 feet 3 inches high, and the absorber tower is 3 feet 6 inches I.D. by 73 feet high.

There is also a Platforming unit of 5,000 b/sd capacity for catalytic reforming of the heavy naphtha.

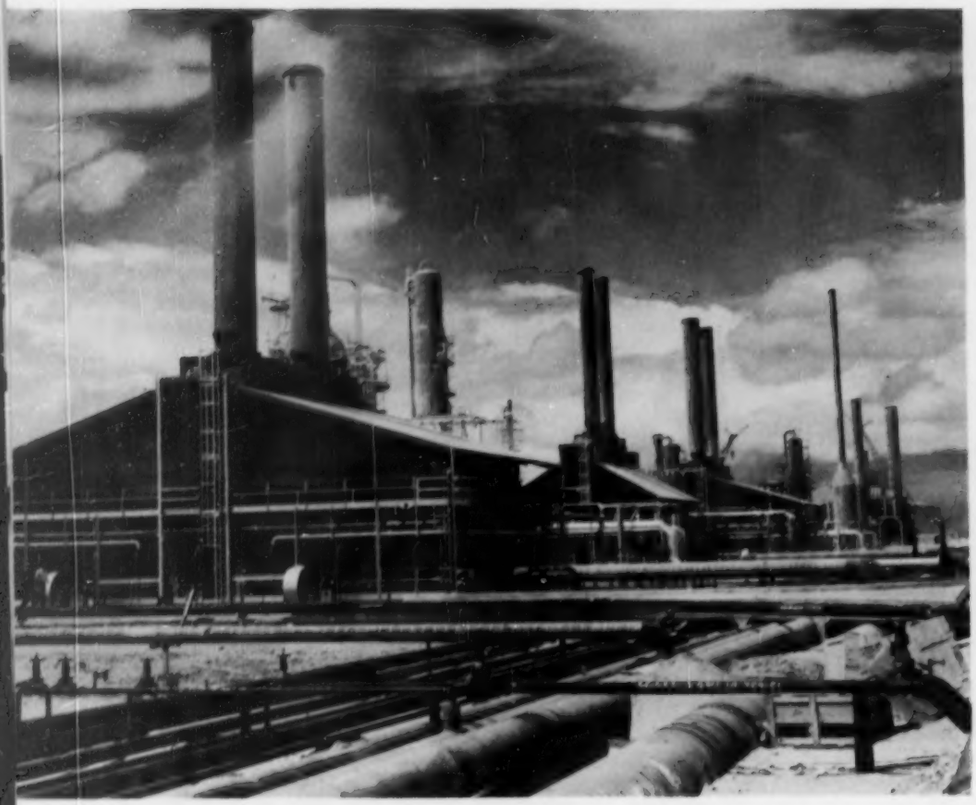
The kerosine, aviation turbo fuel, and light gas oil will be treated in a 5,600 b/sd Hydroforming unit to give finished products of low sulfur content and good color.

The Hydroforming unit, with a chromium-molybdenum catalyst, was developed in the laboratories of the Anglo-Iranian Oil Co., the first commercial unit having been in successful operation at the Llandarcy refinery of that company for a considerable time.

Solutizer units using cresylic acid and tannin will be used for the extraction of sulferetted hydrogen and mercaptans from the light spirits, and the straight run gasoline, cat cracker spirit, tractor vaporizing oil and jet fuel will be finally sweetened in copper chloride units.

Steam production for the refinery when on maximum load will be accommodated by 5 x 75,000 lbs. per hour boilers working at 200 psig.

Electrical energy will be purchased from the State Electricity Commission, the main feed-in being at 22,000 volts, which will be stepped down in the refinery to the working voltage required.



*Atmospheric distillation plant heaters.*

Cooling and circulation water, of which three million imperial gallons per hour will be required, will be drawn from Cockburn Sound, and directed through the distribution system at a pressure of about 50 psig.

Over 2,000 cubic feet per minute of compressed air at 100 psig will be required, basically for instrument control, catalyst removal, etc.

A 20,000,000-gallon reservoir to supply the needs of both the refinery and the new township with domestic water is being built a few miles from Kwinana by the Western Australian State Government.

Most of the 55 storage tanks scheduled for the refinery have been finished, and erection on the others is well advanced. Much of the circumferential seam welding was done by machine, which covers in three hours the equivalent length of welding done by five men in three days.

Over one quarter of the total 300 miles of piping (ranging in diameter from half an inch to five feet) required for the refinery has been installed.

Two pipe lines, one of 12-inch diameter and the other of 6-inch diameter and 17 miles long, have been laid from the refinery at Kwinana to the docks at Fremantle.

The larger pipe line will carry fuel oil to the existing ships' bunkering installation and the 6-inch line will carry motor spirit and kerosine to existing tankage from which it will be distributed to the hinterland of Western Australia by the Commonwealth Oil Refineries organization, an associate of British Petroleum.

Tankers sailing from the refinery's jetties will carry refined products to the coastal installations at Port Pirie and Adelaide, at Melbourne, Hobart, Port Rembla, Sydney, Newcastle, Brisbane, Townsville and Darwin in Australia and also across the Tasman Sea to New Zealand.

In addition to dredging Cockburn Sound, building highways and railway to Perth and Fremantle, and supplying fresh water and electricity, the Western Australian State Government is building a town site, known as Kwinana, about two and one half miles inland from the refinery. This township will contain four neighborhood units, and in one of them, called Medina, over three hundred of the 1,000 projected houses have been completed and taken over by Australasian

*The Orthoflow fluid cat cracker at Kwinana has a capacity of 12,500 barrels daily.*

*A. E. Mason*

*D. W. K. Barker*

*H. J. W. Braddick*

*C. H. E. Rebbeck*

Petroleum Refinery Ltd. Many are at present occupied by contractors' staff, but will eventually be occupied by married refinery staff, both Australian and imported.

Building has also been commenced and is well advanced on a second neighborhood unit called Calista after an early emigrant ship.

The township of Kwinana will not be occupied solely by refinery personnel, as it is planned for a general population requiring housing in the district. Shops are being built, and a theatre, gardens with a community hall and kindergarten and a hotel will also be part of the development plan. A school on a site of about 12 acres is envisaged and nurseries and other amenities such as playing fields are to be developed. Practically all materials used in this town will be of Western Australian origin.

The costs of this £30-million refinery were incurred approximately as follows:

| | |
|---|---|
| Salaries & wages paid in Australia | £9,000,000 |
| Materials purchased in Australia | £7,000,000 |
| Orders placed in Western Australia | £5,000,000 |
| Orders placed in the United States | £6,500,000 |
| Materials purchased elsewhere | £2,500,000 |

Personnel prominent in the planning, construction and operation of the new Kwinana refinery are:

A. E. Mason, managing director of Australasian Petroleum Refinery Ltd., the company formed to build and operate Kwinana refinery. Mr. Mason spent 21 years in Persia with Anglo-Iranian Oil Co. in various commercial administrative posts. He arrived in Western Australia in May 1952 to work between Anglo-Iranian and the Western Australian government on the Kwinana project and to attend to matters concerning the distribution and marketing of products when the refinery begins operating. Mr. Mason was appointed managing director of A.P.R.L. in July 1953.

R. B. Dummett, managing director of The Commonwealth Oil Refineries Ltd., which will distribute the products from Kwinana. Mr. Dummett, who is also a director of Australasian Petroleum Refinery Ltd., joined Anglo-Iranian Oil Co. in 1936 and has had wide experience of petroleum distribution in the United Kingdom, on the Continent, and in Australia. In February 1953 he was appointed an A.I.O.C. representative on the board of The Commonwealth Oil Refineries Ltd. and succeeded to the managing directorship later that year.

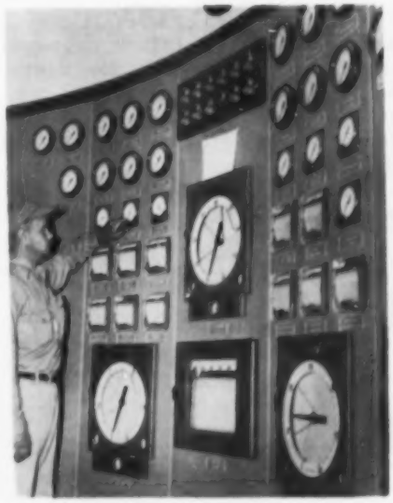
D. W. K. Barker, manager of the Australasian division of the refineries department, Anglo-Iranian Oil Co., in London. Mr. Barker superintended the planning and construction of Kwinana refinery. For nine years before the war Mr. Barker was connected with refinery construction in France, later being appointed refinery engineer at Haifa refinery. In 1946 he was made project manager for the four refineries built after the war for the Anglo-Iranian Oil Co. and its associates in Western Europe. He continued in this position until his appointment in April 1952 as head of the Australasian division.

H. J. W. Braddick, project superintendent in London for the Kwinana project. He joined the Anglo-Iranian Oil Co. in 1934 and has held various engineering appointments in the United Kingdom and overseas. He was a member of the technical party who visited Australia in 1951 and who were responsible for the choice of the site for Kwinana refinery. Mr. Braddick was also appointed to his present position in April 1952.

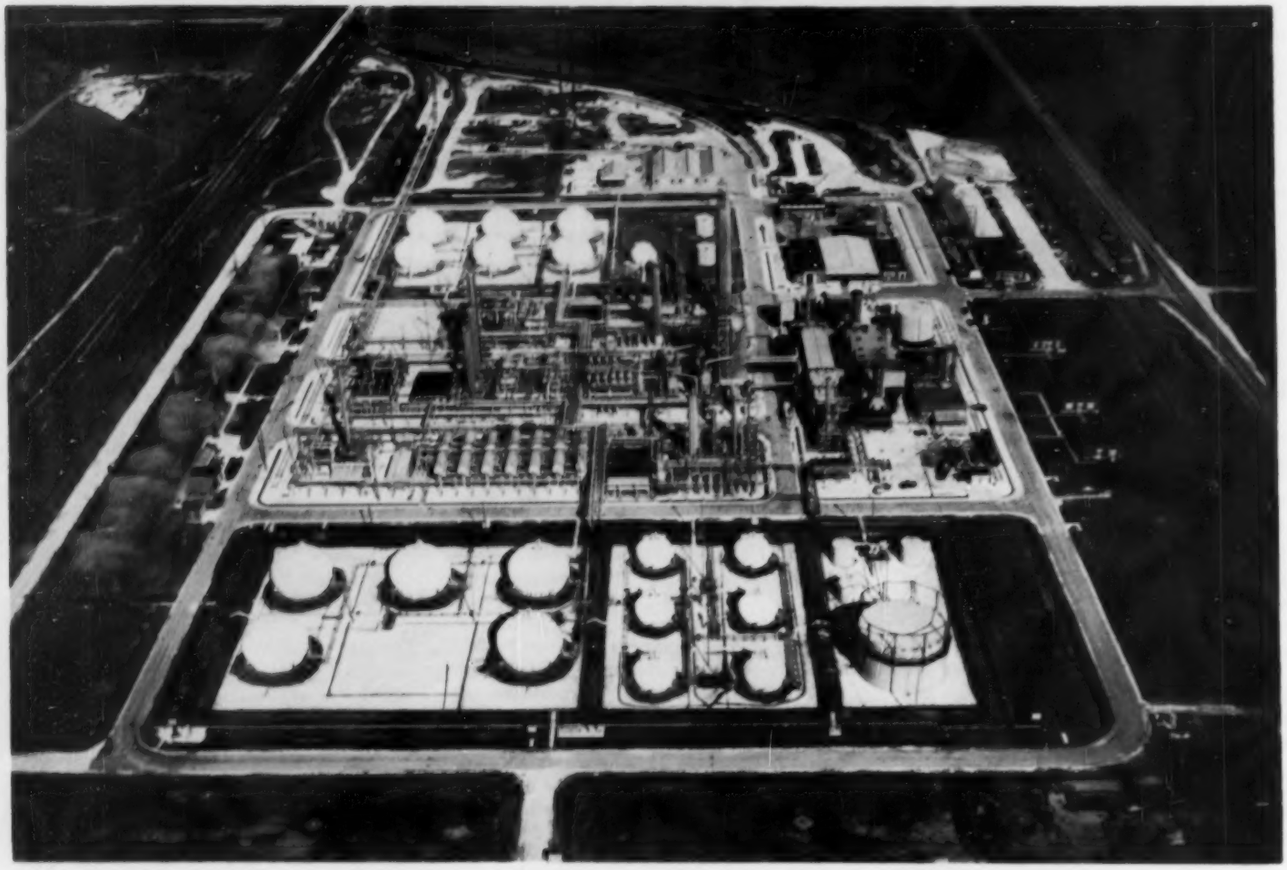
C. H. E. Rebbeck, Anglo-Iranian Oil Company's resident engineer for the construction of Kwinana refinery. After war service with the Royal Engineers, he joined Anglo-Iranian in 1947. In 1948 he took charge of the expansion of Grangemouth refinery in Scotland from which position he was transferred to Kwinana in October 1952.

Gordon Jones, resident manager of construction at Kwinana for Kellogg International Corp., the overall contractors for the refinery. He has been in the employ of M. W. Kellogg Co. and its subsidiaries since 1929 and has served in various engineering capacities on construction projects both in America and abroad. From 1949 to 1952 he was in charge of the erection of several new units being installed at Anglo-Iranian's Grangemouth refinery in Scotland. He and Mr. Rebbeck worked together on this project and towards the end of 1952 met again at Kwinana.

A. T. Dewar, T. R. North and G. M. Leslie, the senior representatives at Kwinana of Costain John Brown Ltd., D. & C. and William Press Ltd. and Kinnear Moodie Ltd., who jointly operate as Kwinana Construction Group Pty., the consortium building the refinery.



*A section of the control room from which the two distillation units and vacuum distillation unit are controlled.*



*Aerial view of the petroleum butadiene plant at Lake Charles, La., currently operated by the Cities Service Refining Corp. under government ownership. It was sold, subject to approval of Congress, by the Rubber Facilities Disposal Commission, to Petroleum Chemicals, Inc., owned equally by the Cities Service Co. and the Continental Oil Co.*

# Sale of government rubber plants nears completion

**By Joseph Huttlinger**

THE U. S. GOVERNMENT, which produces nearly one third of the world's total rubber supply in its 27 war-built synthetic plants, finally has taken steps toward bowing out of this manufacturing enterprise.

The U. S. Rubber Facilities Disposal Commission, created by act of Congress of August 1953 to sell the plants, has signed contracts disposing of 24 of the facilities to petroleum, rubber and other companies. The contracts are now subject to veto by the U. S. Attorney General or the U.S. Congress.

Of the other three plants, one at least, at Louisville, Ky., may yet be sold. Another at Institute, W. Va., brought no bids, and one at Baytown, Texas, may be reoffered under pending legislation.

The details of the sales, as disclosed by the commission in a report to Congress on January 2, show that nine petroleum companies have signed up to buy nine of the facilities, and part interest in six more. The list includes:

Shell Chemical Corp., three plants; Phillips Chemical Co., two plants; Humble Oil and Refining Co., two plants; Esso Standard Oil Co., one plant; Standard Oil Co. (Calif.) one plant; Gulf Oil Corp., part interest in two plants; The Texas Co., part interest in two plants; Cities Service Co., part interest in one plant; and Continental Oil Co., part interest in one plant.

Four rubber companies have agreed to buy six plants and part interest, along with petroleum firms, in four more. The rubber companies are: Firestone Tire and Rubber Co., two plants; Goodyear Synthetic Rubber Co., two plants; U. S. Rubber Co., two plants and part interest in two more along with The Texas Co.; and B. F. Goodrich Chemical Co., part interest in two plants along with Gulf Oil Corp.

The other buyers are the Copolymer Corp., buying two plants; and Koppers

Co., Food Machinery and Chemical Corp., and American Synthetic Rubber Corp., with one each. The last is a combination of 29 firms including three in the footwear field.

Companies now operating the plants for the government are buying the majority of the plants. Thus sixteen of the plants are to go to the companies presently operating them, six more are to go to the present operators teamed up with one or more other companies, and two are to go to newcomers.

The government's rubber facilities include 448 tankcars which, however, have not been sold, although they were offered.

The contracts were signed after bids were invited from all comers, and after six months of negotiations between the commission and the private companies about price and terms. Although Attorney General Herbert Brownell, Jr., has a chance to veto any of the sales, he has been kept informed of developments, and there is little to indicate he has any reservations. The big hurdle may lie with the U.S. Congress.

Under the timetable of the disposal program, the Congress has 60 days, until March 28, to disapprove any sales. If Congress fails to act, the sales go through as proposed, and the transfer to private industry is to be completed in 60 days more, by the end of May.

The Congressional interest centers on three main factors: national security, the price to be paid, and the monopoly angle. As for the first, the sales carry clauses that the plants shall be kept for rubber output for at least 10 years, which should meet the wishes of Congress. As for the price and the monopoly angle, that is certain to bring some arguments in the Congress. The plants cost the government $478 million, and the disposal law calls for "full fair price" to be paid.

In the event Congress votes to bar the sale of any one plant, all other bidders, even if under contract to buy a plant, automatically are given the right to withdraw. Any plant not sold is to be shut down by the government under terms of the law.

The huge GR-S plant at Institute, W. Va., which has been shut down since September 1953, drew no bidders. A copolymer plant at Baytown, Texas, which was not sold, actually is regarded as an attractive investment by industry. The bid offered on the plant was rejected by the government; Representative Albert Thomas, D., Texas, is urging new legislation to permit the offering of new bids for the plant. While chances are good that the legislation will be passed, there is some question whether this would delay the sale of all the plants.

One requirement of the disposal act clearly has been made. That is that facilities sold have a capacity of 500,000 long tons of GR-S rubber and 43,000 long tons of butyl. The plants under contract have capacities of 688,600 and 43,000 tons.

Although the sales of the plants are yet to be completed, major strides have been taken toward disposal. While the Congress could put up the stop sign, there is a wide feeling that it actually will permit the plants to be sold and thus restore free enterprise and competition to this industry. If the sales go through, the transfer to private industry might be completed by the end of May.

**GOVERNMENT-OWNED PLANTS OFFERED FOR SALE**

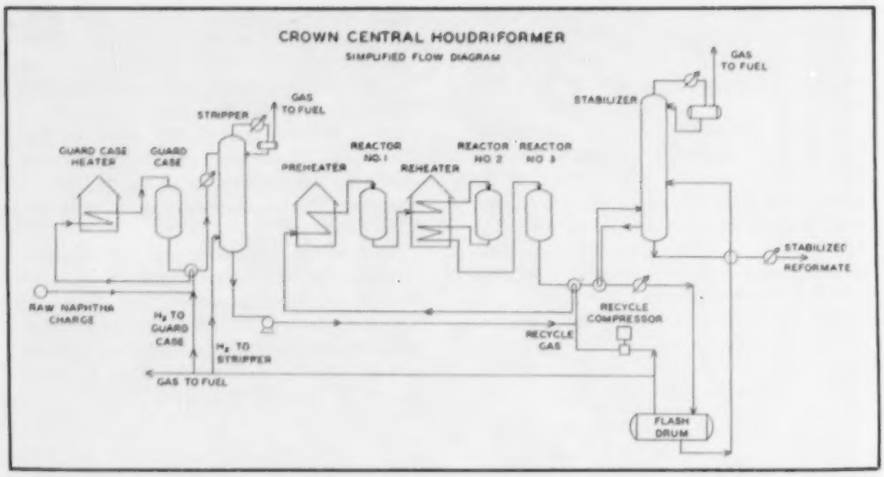
| | Maximum Annual Capacity | U. S. Cost Thousands of $ | Present Operator | Sold To |
|---|---|---|---|---|
| SYNTHETIC RUBBER (GR-S) PLANTS | | | | |
| Baton Rouge, La. | 48,000 LT | 6,956 | Copolymer Corp. | Operator |
| Akron, Ohio ... | 30,000 LT | 6,262 | Firestone Tire & Rubber Co. | Operator |
| Lake Charles, La. | 99,600 LT | 12,470 | Firestone Tire & Rubber Co. | Operator |
| Baytown, Texas . | 44,000 LT | 7,786 | General Tire & Rubber Co. | Not Sold |
| Port Neches, Texas ..... | 90,000 LT | 19,532 | B. F. Goodrich Chemical Co. | Goodrich-Gulf Chemical Co. (owned equally by B. F. Goodrich & Gulf Oil Corp.) |
| Institute, W.Va. (in stand-by) | 122,000 LT | 17,852 | B. F. Goodrich Chemical Co. | Not Sold—No Bids |
| Akron, Ohio ... | 16,800 LT | 7,463 | Goodyear Synthetic Rubber Corp. | Operator |
| Houston, Texas . | 99,600 LT | 12,870 | Goodyear Synthetic Rubber Corp. | Operator |
| Louisville, Ky. .. | 44,000 LT | 6,571 | Kentucky Synthetic Rubber Corp. | American Synthetic Rubber Corp. (composed of 29 manufacturing companies) |
| Los Angeles, Cal. | 89,900 LT | 15,248 | Midland Rubber Corp. | Shell Chemical Corp. |
| Borger, Texas .. | 63,000 LT | 8,690 | Phillips Chemical Co. | Operator |
| Naugatuck, Conn. | 21,600 LT | 9,200 | United States Rubber Co. | Operator |
| Port Neches, Texas ..... | 88,000 LT | 11,334 | United States Rubber Co. | Texas-U.S. Chemical Co. (owned equally by The Texas Co. & U.S. Rubber Co.) |
| | | $142,235 | | |
| BUTYL RUBBER (GR-1) PLANTS | | | | |
| Baytown, Texas. | 43,000 LT | 25,330 | Humble Oil & Refining Co. | Operator |
| Baton Rouge, La. | 50,000 LT | 25,387 | Esso Standard Oil Co. | Operator |
| | | $50,717 | | |
| BUTADIENE PLANTS—PETROLEUM | | | | |
| Lake Charles, La. | 63,000 ST | 16,509 | Cities Service Refining Corp. | Petroleum Chemicals, Inc. (owned equally by Cities Service Co. & Continental Oil) |
| Baton Rouge, La. | 23,000 ST | 8,973 | Copolymer Corp. | Operator |
| Baytown, Texas . | 46,000 ST | 18,201 | Humble Oil & Refining Co. | Operator |
| Port Neches, Texas ..... | 205,000 ST | 54,465 | Neches Butane Products Co. | Goodrich-Gulf & Texas-U.S. Chemicals, Inc. (in equal shares) |
| Borger, Texas .. | 74,000 ST | 35,410 | Phillips Chemical Co. | Operator |
| Houston, Texas . | 90,000 ST | 29,964 | Sinclair Rubber Inc. | Feed Machinery & Chemical Corp. |
| Torrance, Calif. . | 48,000 ST | 19,312 | Shell Chemical Corp. | Operator |
| El Segundo, Calif. | 50,000 ST | 7,834 | Standard Oil Co. of Calif. | Operator |
| | | $190,668 | | |
| BUTADIENE PLANTS—ALCOHOL | | | | |
| Louisville, Ky. (in stand-by) | 87,000 ST | 34,142 | Carbide & Carbon Chemicals Co. | Negotiations still on. |
| Kobuta, Penna. (in stand-by) | 128,000 ST | 48,638 | Koppers Company, Inc. | Operator |
| STYRENE PLANT | | | | |
| Los Angeles, Cal. | 62,500 ST | 11,932 | Dow Chemical Company | Shell Chemical Corp. |
| OTHER FACILITIES (DDM CHEMICAL PLANT) | | | | |
| Naugatuck, Conn. | 2,400 ST | 350 | United States Rubber Co. | Operator |
| | | (Total U. S. Cost) $478,682 | | |

LT=Long Tons ST=Short Tons

**BIDS ON GOVERNMENT-OWNED PLANTS**

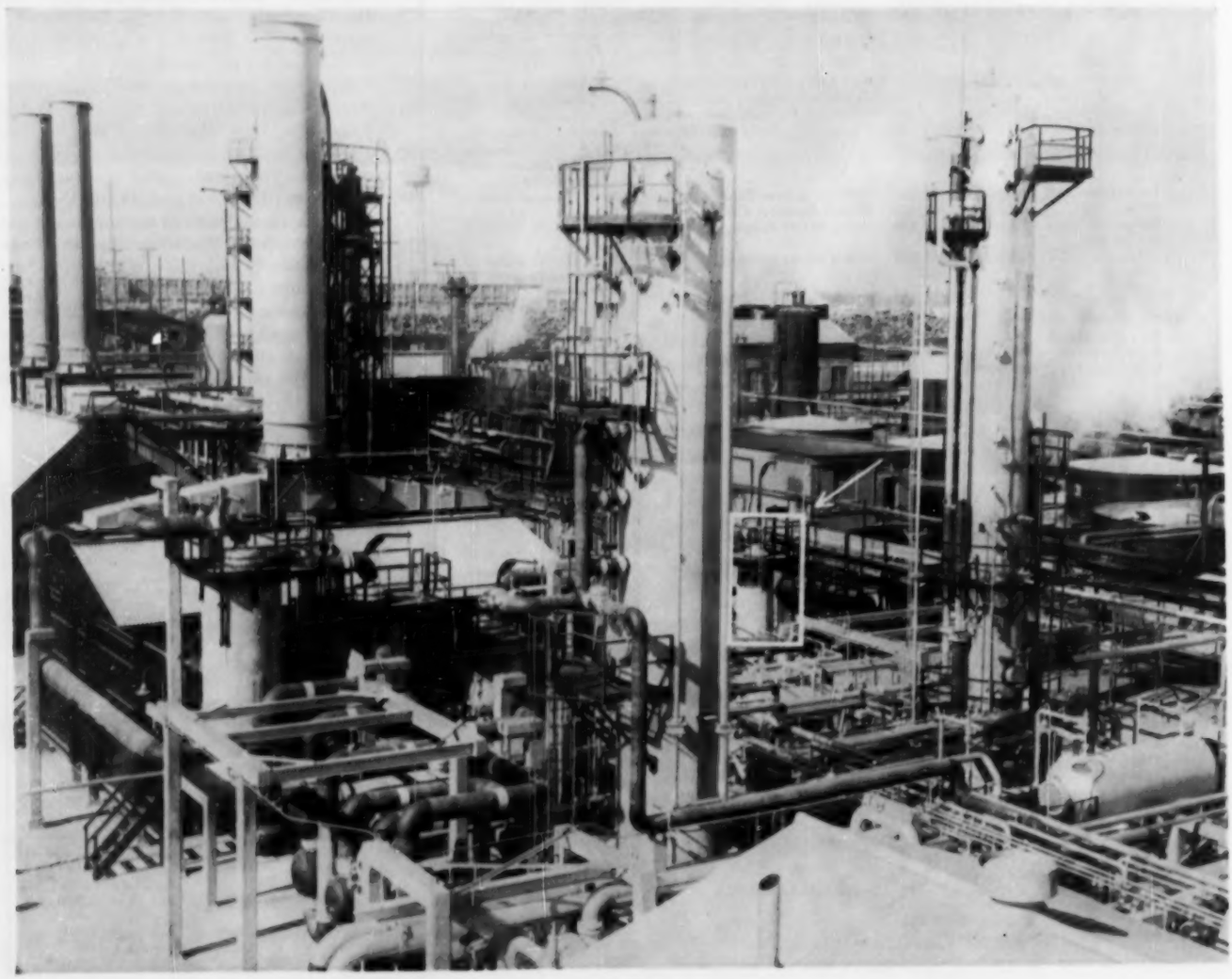
| | |
|---|---|
| SYNTHETIC RUBBER (GR-S) | |
| Baton Rouge, La. ..... | $5,000,000 |
| Akron, Ohio (Firestone) .... | 2,250,000 |
| Lake Charles, La. ..... | 11,650,000 |
| Port Neches, Tex. (Goodrich) | 13,000,000 |
| Akron, Ohio (Goodyear) .... | 2,075,000 |
| Houston, Texas ..... | 11,889,000 |
| Louisville, Ky. ..... | 2,240,000 |
| Los Angeles, Calif. ..... | * |
| Borger, Texas ..... | 4,525,000 |
| Naugatuck, Conn. ..... | 3,200,000 |
| Port Neches, Tex. (U.S. Rubber) | 11,500,000 |
| BUTYL RUBBER (GR-1) | |
| Baytown, Texas ..... | 17,500,000 |
| Baton Rouge, La. ..... | 14,857,000 |
| BUTADIENE—Petroleum | |
| Lake Charles, La. ..... | 16,000,000 |
| Baton Rouge, La. ..... | 5,000,000 |
| Baytown, Texas ..... | 8,886,000 |
| Port Neches, Tex. ..... | 53,000,000 |
| Borger, Texas ..... | 19,100,000 |
| Houston, Texas ..... | 24,197,000 |
| Torrance, Calif. ..... | * |
| El Segundo, Calif. ..... | 1,500,000 |
| STYRENE | |
| Los Angeles, Calif. ..... | * |

*Shell bid $30,000,000 for three plants.




*Guard case reactor of new Houdriformer now on stream for Crown Central Petroleum Corp. at Pasadena, near Houston, Texas, isolated and indicated by arrow in this general view of unit. Left and slightly above compressor house roof may be seen feed-effluent exchangers, three main Houdriformer reactors, and stack rising from reformer heater. Tower in foreground is stabilizer. Charge stripper tower appears at right. Below it may be seen the stabilizer accumulator.*

# New Guard Case Houdriformer



*Ground level view shows compressors and compressor knockout drum in compressor house at left, behind which rises stabilizer tower. At right, charge stripper tower rises behind control house.*

# at Crown Central Refinery

*Construction of the Crown Central Houdriformer was complicated by necessity of removing two of the major towers — the guard case stripper and the stabilizer — from a congested operating area without interfering with adjacent operating equipment. Pre-planning and prefabrication of piping, where possible, permitted a rigid construction schedule. The only field welds were those absolutely necessary in the final assembly. Operation of the unit is simplified by virtue of complete instrumentation, compact physical layout, the use of a graphic control panel, and the installation of a fully automatic alarm-shutdown system. Only two operators are required.*

CROWN CENTRAL PETROLEUM CORP. placed its new Houdriformer on stream at its Pasadena refinery near Houston, Texas, on December 14, 1954. Within 72 hours, the new unit was adding more than the specified 5,000 b/sd of high octane blending stocks to the refinery pool.

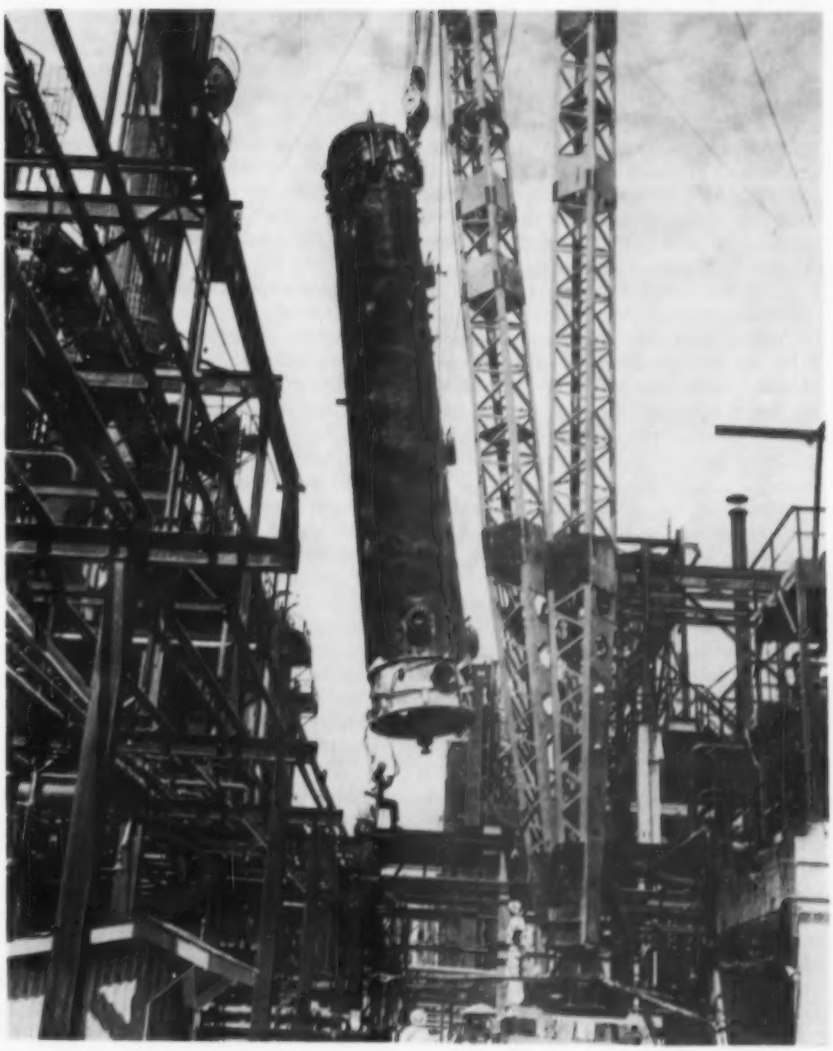
Before addition of the Houdry pretreater and reformer, Crown's operation consisted of about 35,000 b/d throughput to conventional crude running facilities, thermal cracking and reforming units, and Thermofor catalytic crackers, with supplemental polymerization facilities for conversion of propylenes and butylenes.

For many years, a high ratio of catalytic cracking facilities to crude capacity had enabled the refinery to achieve and maintain a favorable competitive position in the manufacture of high octane motor fuels.

Projections made in 1952 indicated production plans of the automotive industry and competition within the petroleum industry would require further modernization of the refinery to meet octane levels forecast for 1955 and beyond.

After extensive economic studies, Crown's management decided on catalytic reforming for up-grading of straight-run gasolines, expansion into production of higher quality aviation blending stocks, and production of benzene, toluene, xylenes and other aromatics.

Basic process designs for the new unit were furnished by Houdry Process Corp., Philadelphia, Pa., late in 1953 and the Blaw-Knox Co. was awarded the construction contract early in 1954. The chemical plants division of Blaw-Knox handled over-all engineering, procure-



**TYPICAL CHARGE STOCKS**

| | Int. Swt. W. Texas | W. Central Texas |
|---|---|---|
| API | 57.9 | 58.0 |
| IBP | 175 | 179 |
| 5 | 200 | 200 |
| 10 | 210 | 208 |
| 30 | 228 | 227 |
| 50 | 260 | 248 |
| 70 | 295 | 275 |
| 90 | 331 | 320 |
| FBP | 374 | 370 |
| F-1 Clear | 38.9 | |
| F-1 + 3cc | 56.9 | |
| Total Sulfur | .072 | 0.10 |
| **Debutanized Product** | | |
| API | 51.0 | 49.7 |
| IBP | 136 | 134 |
| 5 | 163 | 170 |
| 10 | 184 | 182 |
| 30 | 211 | 209 |
| 50 | 244 | 238 |
| 70 | 267 | 271 |
| 90 | 324 | 318 |
| FBP | 394 | 400 |
| **10# RVP Reformate** | | |
| Yield, Vol. % of Chg. | 95.0 | 93.4 |
| F-1 Clear | 87.5 | 88.1 |
| F-1 + 3cc | 97.0 | 97.9 |

ment and construction of the catalytic reformer through its western headquarters at Tulsa, Okla. A peak staff of 81 field men completed the project in 140 working days.

Integration of the Houdriformer into the refinery required major revisions and modifications of the crude running facilities to provide proper feed stocks. The crude unit furnace was replaced with a large Alcorn heater, thus providing heat for the fractionation necessary to produce a select Houdriformer charge. A pre-flash tower operating on feed-product heat exchange was provided on the crude unit to strip lighter materials, including pentanes and some hexanes, prior to fractionation of the reformer charge. Reforming efficiency and capacity were increased by eliminating these lighter constituents, whose octane levels are not appreciably improved by reforming.

Increasing the reflux ratio combined with reducing the load of light ends on the main fractionator of the crude unit improved fractionation and eliminated heavy ends from the reformer charge.

A stabilizer tower was installed to remove propane and lighter products from the pre-flashed butanes and pentanes. This tower produces a 26 pound Reid vapor pressure stock with a controlled dry point which is extremely useful in regulating front-end volatility and vapor pressure in gasoline blending.

In addition to the foregoing major changes, it was necessary to install additional field lines, tankage, water cooling tower equipment, etc.

The Houdriformer itself was designed to process 5,000-plus b/sd stocks typical of those processed in Gulf Coast refineries, using naphtha cuts boiling between 175°F and 385°F. Both paraffinic and naphthenic crudes are run in varying quantities by the refinery, and the Houdriformer was designed to operate under these varying conditions controlled to give the yield-octane relationships dictated by over-all refinery economics.

Crown currently processes low sulfur crudes (see table). However, to permit operation using higher sulfur-content stocks, Houdry engineers incorporated a simple, compact pre-treating or "guard case" stage.

This feature of the Houdriformer consists of a small catalytic reactor and a stripper tower, operating at a pressure slightly lower than the high pressure flash drum in the reactor section. Hydrogen is supplied without further compression from the flash drum, and no recycling or gas treating is needed.

Catalyst in the three main reactors — Houdry Type 3 pellets — is so well protected as a consequence that the Houdriformer can process combined cracked and straight-run naphthas having a total original feed sulfur content approaching 0.3 weight percent, and can be adapted for even higher sulfur feeds.

Periodic inspections of Houdriformer laboratory pilot plants and commercial units, according to Houdry engineers, indicate that the guarded reforming catalyst maintains excellent resistance to deactivation, with no substantial change in either selectivity or activity for periods approaching a year when optimum care and control of variables is observed.

This relatively small, high activity, high space-velocity guard case stage strips the stock of contaminants and thereby eliminates need for a more complicated pre-treating process.

A brief description of the process, as indicated in the accompanying flow diagram of Crown's new Houdriformer, is as follows:

Pre-treat Unit: Raw naphtha is pumped and mixed with hydrogen at 400 psig, to form a combined charge which passes through exchangers, a pre-heater furnace and on through catalyst contained in the guard case. No reforming takes place in the guard case because of the relatively milder conditions as compared with the three Houdriformer reactors.

Sulfur compounds in the charge are converted to $H_2S$. Contaminants inimical to the reforming catalyst, such as heavy metallic compounds (salts of copper and lead), are filtered out in this pre-treat reactor. Unsaturates, if present, are hydrogenated.

The partly cooled guard case effluent, consisting principally of treated naphtha, traces of $C_4$ and lighter compounds, and $H_2S$, is discharged to the top tray of a stripper tower. Hydrogen stripping gas is provided by introducing a portion of the net make gas from the high pressure Houdriformer flash drum to the bottom of the stripper tower. The overhead gas from the stripper tower contains $H_2S$, $NH_3$, water, and any other fixed gases present in the feed; this stream is rejected to the refinery fuel system. Desulfurized naphtha at the bottom of the tower is used as charge for the Houdriformer.

Houdriformer Unit: The desulfurized naphtha from the pre-treat stripper tower is charged to the Houdriforming process, in combination with hydrogen-rich recycle gas separated from the final reactor effluent and circulated by two 440 hp reciprocating compressors.

The combined feed is pre-heated by exchange with hot effluent from the final reactor to 710°F, passed through the pre-heater furnace and is brought to the top of the first reforming reactor as superheated hydrocarbon - hydrogen vapor. With intermediate reheating, the stream then passes through the second and third catalytic reactors. A multi-cell furnace contains the pre-heat and two reheat sections, and includes a common convection section to obtain part of the initial pre-heat and improve over-all efficiency.

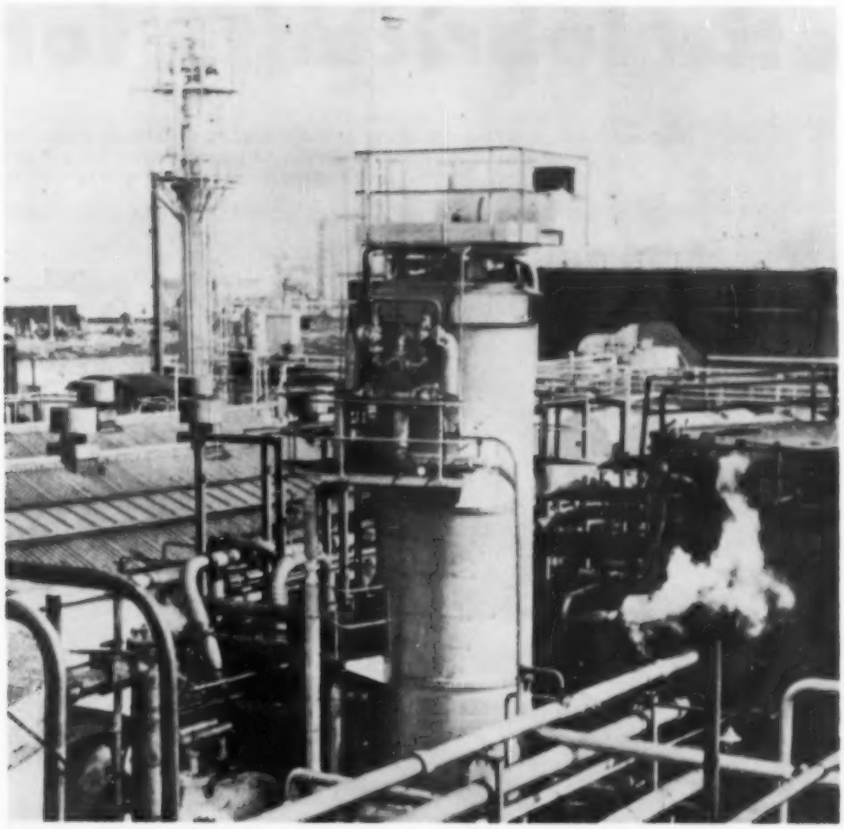
The Houdriformer reactors are a departure from many earlier catalytic reformers in that they are of low alloy construction with external insulation, whereas earlier reformers were carbon steel with internal insulation. Alloy piping is employed for all process piping, etc., carrying product at temperatures greater than 500°F.

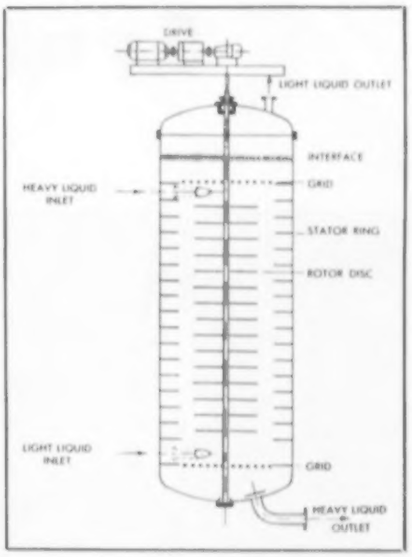
Emerging from the final catalytic reactor, the effluent is partly cooled and condensed by exchange with the reactor charge stream and a water-cooled condenser, and is then separated by flashing at 100°F in a horizontal high pressure separator drum. Here the overhead hydrogen-rich vapors are split; the largest share of hydrogen recycles to the reactor stream and the remainder goes to the pre-treat naphtha raw feed charging to the guard case, to the pre-treat stripper tower, and to refinery fuel. The bottoms product of the high pressure separator drum (reformate) flows to a stabilizer tower. Heat for reboiling the stabilizer tower is furnished by the hot effluent stream of the Houdriformer reactors. The stabilizer tower releases $C_4$ and lighter overhead vapors to refinery fuel lines.

The reformate gasoline bottoms product retains about 91 percent of the $C_5$'s of the high pressure flash liquid. The liquid reformate undergoes exchange and cooling, and is pumped to blending and storage.

On its tenth day after going on stream, inspection showed Crown's Houdriformer to be charging 5,580 b/d and producing about 93 percent reformate, running 82 F-1 clear and 95 F-1 with 3cc. TEL.

The new unit was designed to provide maximum automatic control. All main control instruments are located on a graphic control panel. Two operators are required for operation of the combined units. In the event of loss of either charge pumps or circulating compressors, necessary process adjustments may be made speedily at the control panel, minimizing danger to catalyst or equipment.






*Rotating Disc Contactor in simplified cross section.*

*Rotating Disc Contactor in 2,000 b/d furfural extraction unit at Shell Haven refinery, England.*

# Shell liquid-liquid extractor

A NEW LIQUID-LIQUID extraction apparatus has been developed to the commercial stage by Shell Development Co. and now is being offered to the refining and petrochemical industry through the Lummus Co. and General American Transportation Corp. The equipment is called the Rotating Disc Contactor, RDC for short.

Commercial units are now operating in five Shell refineries and in the Salzberger refinery at Wintershall A. G. in Germany. Applications have been made in lubricating oil extraction with furfural, extraction of a mixed chlorinated hydrocarbon feed and the purification of synthetic detergent solutions. Experimental work suggests that mercaptans may be separated from gasoline fractions economically and effectively.

The RDC is a vertical cylindrical tower. It has so far been built to diameters ranging from two inches to over seven feet. Within the tower, a vertical rotor shaft bearing a series of flat, smooth discs whose diameters are about half the width of the cylinder, rotates to provide agitation of liquids. Stator rings are fixed to the inside wall of the tower between the discs. The inside diameters of the rings are greater than the diameters of the discs, allowing easy removal of the shaft. The stator rings form open "compartments" within the vertical shell in which contact of the swirling liquids is effected.

In large size units, feed inlets are arranged tangentially in the direction of rotation. An extra stator ring and a wide mesh grid are fitted into the shell to separate the feed inlet zone from the settling compartment. Use of corrosion-resistant materials is possible.

Most units operate at atmospheric pressure, but pressures up to 70 psig have been used. Development work on high pressure units is in progress.

Unlike the usual conventional liquid-liquid contactor, RDC employs smooth discs and hence no interstage settling and redispersion is employed. Discs with protrusions were found by Shell investigators to reduce unit capacities.

In continuous operation, the heavy liquid is piped into the upper part of the tower; the lighter liquid is pumped into the lower section. Gravity, in combination with the adjusted rotation of the discs on the shaft, causes contact and controlled dispersion. The light phase is then taken from the top, the heavy from the bottom.

In furfural extraction, Shell has found that the required solvent ratios for the RDC are lower than for packed columns. One RDC column, 6 feet 6 inches in diameter and only 24 feet high, has replaced a 14-stage mixer-settler system in the furfural-lube oil serivce. Cost of the RDC was only half that of the mixer-settler. Hold-up of solvent in the RDC is only 10 percent of that in the former system. Mechanical solvent losses have been reduced by 30 percent. Another RDC replaced a 100-foot-high packed column and cost less than 40 percent as much.

RDC was described in a paper presented to the recent New York symposium of the American Institute of Chemical Engineers by G. H. Reman and R. B. Olney, Shell chemical engineers at research centers in Amsterdam, Holland, and Emeryville, California, respectively.

# Synthetic lubricants for

*Vickers Viscount turboprop. Sixty of these airplanes are to go in service shortly on the routes of Capital Airlines. The four Rolls Royce Dart engines are lubricated with synthetics.*

SIX YEARS AGO turbojet engines were being built that developed more than 6,000 pounds thrust. Today the United States and Great Britain, and undoubtedly the U.S.S.R. as well, have engines under test that develop 15,000 pounds. With afterburners these engines have ratings of 20,000 pounds or more thrust. Progress in the art of the gas turbine is coming to an ever-accelerated pace, and turbojets of 25,000 pounds thrust or more are on the drawing boards.

The turboprop engine, a more complicated application of the gas turbine principle, is emerging as an important factor in the aircraft field. British four-engine turboprop transports have been in commercial service for several years and according to their operators have proved profitable. These very aircraft, built by Vickers Armstrong, have now invaded the American market and are scheduled to go in service on the routes of Capital Airlines within a few months. Meanwhile, advanced turboprop engines of American design are being installed in U. S. military aircraft and on military versions of commercial transports.

Six years ago the turbine engine was still regarded as a relatively simple type of engine when compared with the highly developed and correspondingly complex reciprocating engines that are needed to give the performance required of modern aircraft. But it seems axiomatic that with any engine, higher outputs are associated with greater complexity. Any doubts about this conclusion can be dispelled by comparing the powerplant under the hood of a 1955 automobile with the four-cylinder, in-line engine in the old—and we must admit reliable—Model T.

All of us are familiar with the fact that as the automobile engine increased in complexity, and what is more important, in efficiency, its appetite for fuels and lubricants became more selective. The same story was true, particularly in the case of fuels, with aircraft engines, and it is being repeated for the turbojets and turboprops. Fuels, so far, for turbine engines have been a relatively simple matter in which the availability has usually played a more important role than the refining techniques. Octane number, or some equivalent property, that would call for large expenditures for special refining facilities, has not been recognized as necessary in jet fuels, and it is hoped that the jet engine designers will keep the fuel requirements of this engine as simple as possible.

As the output of the jet engine has increased, the conditions under which the lubricating oil must perform its functions have become more extreme. For example, the temperature of the bearings can reach 500°F or more, while the air through which the aircraft is flying may be —65°F. Furthermore, the oil may be exposed to temperatures of 600°F or more for short periods of time as a result of what is known as the soak-back effect that takes place when an engine is shut down. Given these extreme conditions, we see that a turbine oil must have the following properties.

1. The oil must remain fluid and be readily pumpable at the lowest temperatures encountered.

2. The oil must remain stable at the highest temperatures. Chemical decomposition or cracking with the formation of undesirable deposits is to be avoided. Furthermore, the oil must be non-corrosive.

3. The volatility of the oil must be low so that evaporation does not become excessive at the high temperatures and high altitudes encountered in flight. In turbojet engines an oil of high volatility has a tendency to boil off bearings during the critical period of high temperature following shut-down. Furthermore, the flammability characteristics of a volatile oil are usually undesirable.

4. In turboprop engines the gears used to reduce speed of the propeller (to 2,000 rpm compared with up to 20,000 rpm of the turbine) are under extreme loads. Unfortunately, the temperatures encountered in the engine militate against the

# turbojet engines

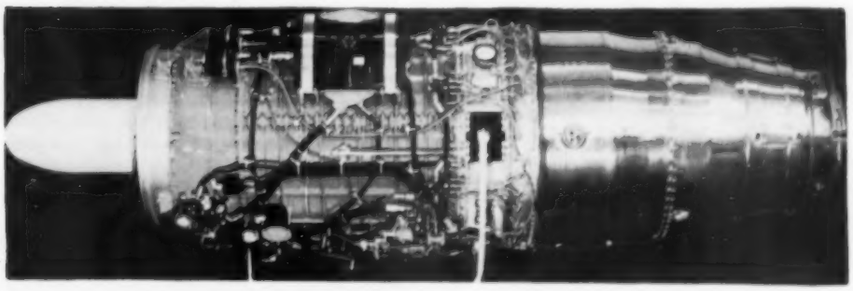
use of extreme pressure additives and it is necessary for the oil to have inherently the load-carrying capacity required.

Petroleum lubricants used in turbine engines are Grade 1010 and Grade 1005 and meet U. S. Military Specification MIL 0-6081A. These oils are in use, but they are being superseded by synthetic oils that are tailor-made to meet the severe conditions of turbine service. In fact, the armed services are already specifying synthetic lubricants that are defined by specification MIL-L-7808B. According to an estimate made by Brig. Gen. W. W. White, USAF, staff director of the supply and logistics petroleum division of the Office of the Assistant Defense Secretary, the military will require 1,705,000 gallons of these synthetic lubricants within the next three years. Cost of this type of lubricant is roughly $5 a gallon, though there are some formulations that cost $10 a gallon or more. Large-scale production, of course, can be expected to bring these costs down, but nevertheless the dollar volume of these new lubricants will be large, and it will increase as the demand for them goes up.

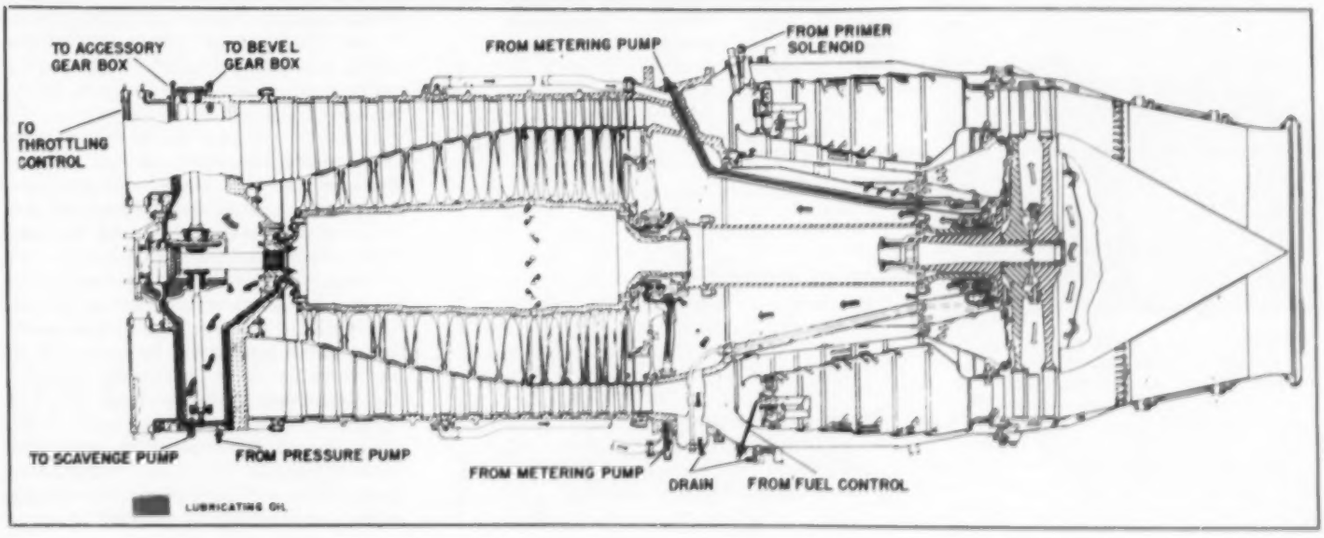
There are innumerable chemical formulations that have been tested in the search for the ideal lubricant for the jet engine. In general, compounds having approximately the desired qualities belong to the following classes of compounds: silicones, silicate esters, organophosphorus compounds, chlorinated hydrocarbons, polyglycols and diesters. Table I presents a comparison of these various compounds and gives an approximation of their cost. Looking for a moment at this comparison, it will be seen that on the basis of the data presented, the most promising lubricants are to be found in the polyglycol and diester groups. Silicones, for example, are shown to be deficient in wear prevention properties and their stability at high temperatures is marginal; silicate esters are also poor in the same respects; chlorinated hydrocarbons have poor viscosity-temperature characteristics and they are corrosive; organo-phosphorus compounds are unstable at the high temperatures encountered.

The polyglycols are a group of organic chemical compounds, the most familiar being the ethylene glycol that is sold as a permanent anti-freeze for automobiles. Ethylene glycol is, of course, the most elementary of the glycols. Those that are of interest as lubricants *per se* or as components in the preparation of lubricants are triethylene glycol, polyethylene glycol, dipropylene glycol and tri- and polypropylene glycol. These glycols are derivatives of petroleum. As such they are comparatively low-cost materials, though of course cost is high in comparison with straight mineral oils (see Table I). Their thermal stability is good and they have good wear prevention properties. Under high temperatures most materials break down to form deposits that have the tendency to plug small orifices. The glycols do break down to some extent, but if provision is made for the volatile by-products to escape, the tendency of deposits to build up is remarkably low. Much more work needs to be done on the evaluation of the glycols for aircraft turbines, and it has been suggested that they may be used advantageously in combination with diesters.

Esters are a group of organic com-



*Lubrication system of the Curtis-Wright J-65 engine. A large passage carries oil to lubricate the front main bearing, the internal accessory drives, and the accessory gear box. A small passage carries oil to supply the center and rear main bearings. A third passage carries oil to lubricate the pump cam shaft bearings. Oil from the center and rear main bearings is vented overboard with bearing cooling air while oil from front bearings is recycled.*



*Martin Aircraft rolls out the world's first multi-jet attack seaplane, the XP6M-1 SeaMaster. Built for the Navy as a mine-layer and photo-reconnaissance aircraft, the SeaMaster is capable of speeds of over 600 miles per hour and will cruise normally at 40,000 feet.*

pounds derived from acids and alcohols and may be likened to the salts of inorganic chemistry that result from the action of acids on bases. Monoesters, of which ethyl acetate is an example, are widely used in industry, but they do not show much promise as lubricants, though there are probable exceptions to this generalization. It is the esters prepared from such dibasic acids as adipic and sebacic that show the most promise as lubricants for turbine engines. In addition to having excellent viscosity-temperature characteristics, good wear prevention properties and high thermal stability, they are noncorrosive to metals and relatively nontoxic. Their chief drawbacks appear to be their high cost and their tendency to cause swelling of rubber seals. A dibasic acid is the basis of the only synthetic oil so far accepted under Military Specification MIL-L-7808B. This is Esso Aviation Turbo Oil 15 (or 35) which is used in most British turbine engines, including the Rolls Royce Dart engine in the Vickers Viscount. This oil is also used in the turbine engines in the Boeing B-52 and the engines in the new series of fighters, the F-100, F-101, F-102, F-103, F-104 and F-105.

Table II lists the properties of mineral oil meeting Specification MIL-O-6081A the requirements of MIL-L-7808B for a synthetic oil, and the corresponding properties of Esso Aviation Turbo Oil 15, a dibasic acid Bis (2-ethylhexyl) Sebacate. Part of the data for this table was taken from the paper "Engineering Possibilities of Synthetic Lubricants," given by W. A. Zisman of the National Research Laboratory before the S.A.E. National Fuels and Lubricants Meeting, Tulsa, November 7, 1952.

So far, the Esso Aviation Turbo Oils are the only synthetic lubricants that have proved acceptable and they are, as noted above, finding quite wide application. It would be idle to suppose that other suppliers are neglecting this field, and it must be assumed that they will eventually have products on the market meeting MIL-L-7808B or future revisions of this specification. One property, not mentioned above, that all synthetic lubricants must have is that of being nontoxic, and they must not decompose under high temperatures to form toxic substances, particularly toxic vapors. This requirement is necessitated by the fact that in many jet aircraft air for pressurizing the cabin is taken from the compressor of the engine. There can be leakage of the lubricant into the compressor zone with the result that the lubricant may vaporize or become atomized and enter the cabin through the air conditioning system. Under these same conditions, it should be pointed out, conventional lubricants can prove objectionable, and there is considerable debate as to whether the compressor should be used as a source of cabin air. In any case, experience would indicate that synthetic oil should not be more toxic than petroleum lubricants.

Synthetic oils are criticized because they are prone to attack surface finishes. This can be very troublesome, particularly in the case of water-based aircraft where it is necessary to protect the surface from salt water. This is, of course, of secondary importance, because so far it has been necessary to concentrate on developing a product that will perform the required lubricating functions. With regard to the latter, it can be expected that in the near future synthetic oils will be available that will be able to withstand operating temperatures considerably in excess of those encountered today. This will help pave the way for engines of even higher outputs.

**TABLE I**

**COMPARATIVE QUALITIES OF SYNTHETIC TUBES**

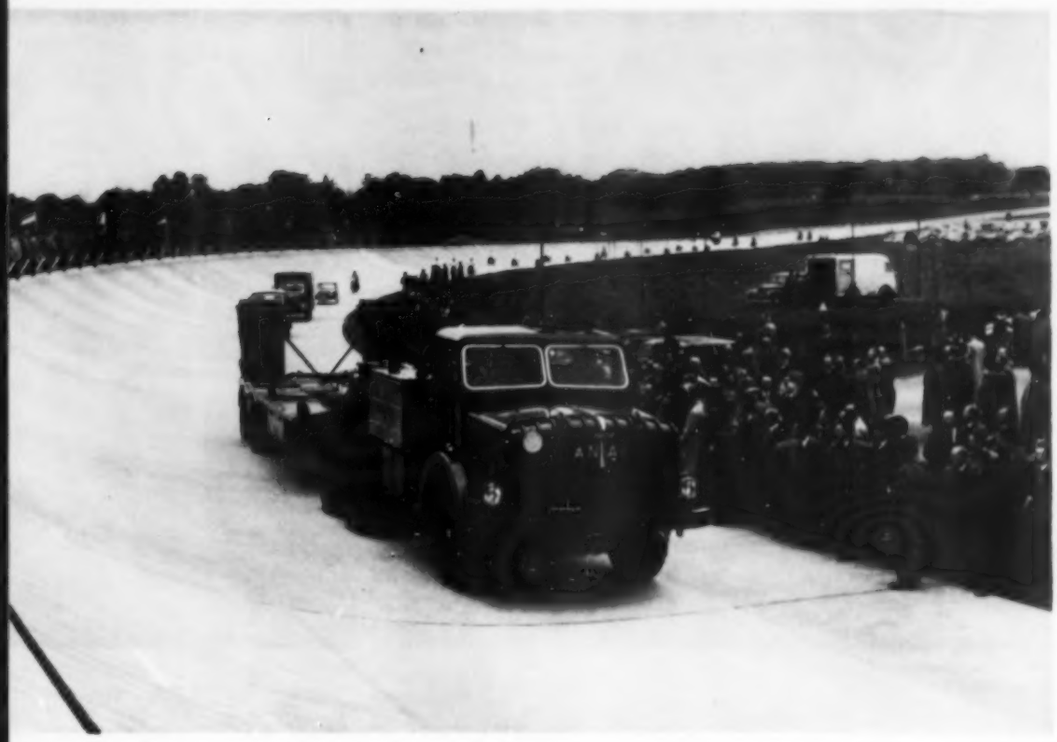
| Property | Silicones | Silicate Esters | Organo Phosphorus Compounds | Chlorinated Hydrocarbons | Poly-Glycols | Diesters |
|---|---|---|---|---|---|---|
| Thermal Stability .. | Good | Poor | Poor | Good | Fair | Good |
| Viscosity/Temperature | Very Good | Very Good | Good | Poor | Good | Very Good |
| Volatility ..... | Very Good | Very Good | Good | Poor | Good | Very Good |
| Wear Prevention ... | Poor | Fair | Very Good | Good | Good | Good |
| Flammability ..... | Good | Fair* | Good | Good | Fair* | Fair* |
| Cost ..... | Very High | Very High | Very High | High | High | Very High |

*About same as Grade 1010 Mineral Oil.

**TABLE II**

**PROPERTIES OF MINERAL OIL MEETING SPECIFICATIONS**

| | Mil-O-6081A Grade 1010 | Mil-L-7808B | Esso A.T.O. 15 | Bis (2 Ethylhexyl) Sebacate |
|---|---|---|---|---|
| Viscosity | | | | |
| c.s. at 210°F. ..... | 2.53 | 3 min. | 3.6 | 3.3 |
| 100°F. ..... | 10 min. | 11 min. | — | 12.6 |
| —40°F. ..... | 3000 max. | | | 14.10 |
| —65°F. ..... | 40,000 app. | 13,000 max. | 12,600 | 8,600 |
| Viscosity Index ..... | 70 | | | 154 |
| Pour Point °F. ..... | —70 max. | —75 max. | —90 | —67 |
| Flash Point °F. ..... | 265 min. | 350 min. | 430 | 450 |



*Not only passenger cars are tested at the Motor Industry Research Association's proving ground at Lindley, near Nuneaton. Here, moving around the speed circuit, is a "Mighty Antar" with its trailer.*

*Filled with water to a depth of four feet, the wading trough is used to test the waterproofing of underparts of vehicles and, with lower water levels, to study the effect of water on brakes.*

# Proving grounds test British cars

HEARTENED by the rapid growth of demand for their products, particularly the expansion of export sales which have doubled within the past few years, British manufacturers of motor vehicles have gone in for a great expansion of plant facilities and a careful study of design calculated to produce models in which British built cars can compete both in domestic and export markets.

Contributing to the industry's effort to provide cars that will fit the demands of motorists and solve the annoying problems that irritate drivers and mar smooth performance is the Motor Industry Research Association's testing center at Lindley, near Nuneaton, in Warwickshire.

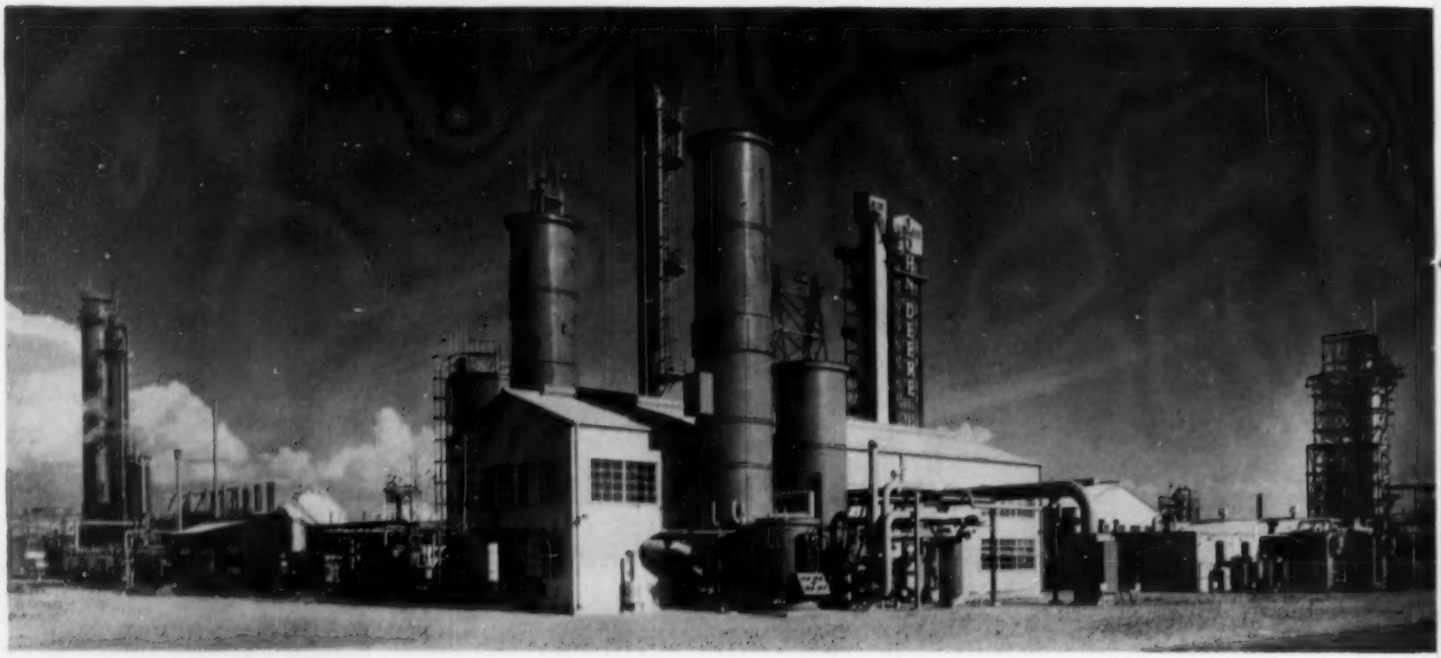
The center represents the culmination of several years of planning and construction going back to 1949. At that time the site was a disused Royal Air Force Station covering 650 acres. Now, with three new laboratories just added, a machine shop, dust tunnel, water splash, high speed circuit and special road surfaces, it is prepared to test every practical requirement of the most exacting service.

In the laboratories, research is directed to determining the strength and efficiency of materials and components. The program includes detailed investigation into the fatigue factor of various crankshafts, brake fade, noise in vehicles and the quality of different alloys.

More than 100 firms are using the facilities provided at the center, and an average of 25 vehicles are being put through their paces there night and day. The 12½ miles of different tracks include a high-speed banked section where 150 mph can be reached, and various treated surfaces and hazards where experts can investigate the behavior of all types of vehicles under the most grueling conditions of the world's worst roads.

Named MIRA (Motor Industry Research Association), the center is financed partly by about 900 firms in the industry and partly by a government grant to provide cooperative research for the motor industry.

*The universal problem of brake fade (loss of efficiency of brakes at high temperatures and during subsequent cooling) has been under investigation at M.I.R.A. for some time. This simple laboratory machine and a test procedure accurately assess the fading characteristics of linings.*



*Ammonia-urea plant at Prior, Okla., built by Foster Wheeler Corp. for Deere and Co. This petrochemical plant has a capacity of 260 tons daily.*

# PETROCHEMICALS—

**By Royal Purcell***

SAMUEL M. KIER of Saltsburg, Pa., a pioneer in the oil industry, is credited with starting the first oil refinery in the United States. Before that, however, he was bottling crude oil drained from a salt well and selling it as a medicine. His "Petroleum and Rock Oil," he said, had cured cholera, coughs, colds, burns, bruises, cold sores, ulcers, bronchitis, asthma, fever, ague, croup, toothache, corns, neuralgia, rheumatism, piles, urinary disorders, indigestion, and liver complaint.

So certain was he of the oil's curative powers that he launched 50 separate gilt-emblazoned wagons in 1848 to peddle his wondrous product from village to village and house to house. There was just one trouble — the gaudy caravan cost more than his profits. The wagons came to their final halt in 1852.

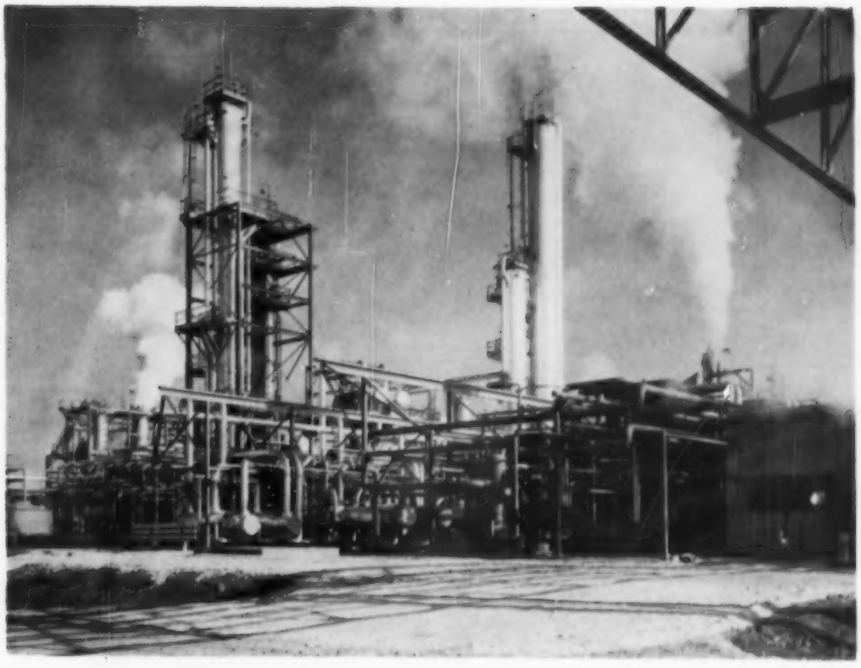
Now, more than one hundred years later, that precious liquid petroleum may yet fail to be the "medicine of unequalled power" so boisterously hawked by Kier, but it is, via petrochemicals, going into the manufacture of such numerous and valuable medical items as antiseptics, chloroform, salves, ointments, adhesives, plasma filters and surgical sutures.

And if petroleum still falls short of Kier's panacean claims, oil and natural gas have more than compensated through their fabulous transformation into thousands of useful products that range all the way from baby's rubbing alcohol to embalming fluid.

Even Aladdin's lamp could scarcely conjure greater miracles than petrochemicals.

By this time, the amazing story of the rapid rise of chemicals made from petroleum and natural gas is well known to oil men. A few paragraph reminders, however, may help underscore their importance. End products include wrinkle-resistant yet crease-firm clothing; paints that are not only odorless, but fast-drying; agricultural chemicals which kill pests, weeds and fungus on the one hand and nourish food plants into a thick, luxuriant yield on the other; ingredients for cosmetics that do such various jobs as adding color, body, aroma and even durability; artificial detergents which wash better than soap; aerosol bombs that spray moth killer or shaving cream; plas-

*Royal Purcell is a staff member of the American Petroleum Institute, working with the American Petroleum Industries Committee. He is author of the current book on foreign relations, *The Three Highways to World War III* (Pageant Press, $2.00).



*Largest ethylene plant in the world at Tuscola, Ill., operated by National Petro-Chemicals Corp. Production is 300 tons daily produced by cracking ethane from natural gas. Photo courtesy The Lummus Co., builder of the plant.*

# *their significance in the oil industry*

tics which may go into toys or underground piping; synthetic rubber with a hundred and one uses; and dozens of other items.

The output of petrochemicals in the United States in 1953 is calculated at 82 percent of all aliphatic chemicals, 47 percent of the aromatic chemicals, and seven percent of the inorganic chemicals.

Indeed, petrochemicals have become "big business" in their own right. In 1953, petroleum-derived chemicals accounted for:

1) More than three-fourths of the nation's butadiene for synthetic rubber.

2) 14 to 19 percent of its plastics.

3) 77 percent of the synthetic detergents.

4) About 50 percent of all nitrogen for fertilizer and 70 percent of all ammonia.

5) 13 percent of all synthetic fibers.

6) Around one-third of the pesticide chemicals.

7) The solvents used in 85 percent of the country's dry cleaning plants.

8) Fifty percent of all sausage skins.

The production of these chemicals has come up fast. They trace their historical start to the extraction of chemicals from refinery gas by the Standard Oil Co. (N.J.) in 1919 and from natural gas by Union Carbide in 1920. Yet output in 1925 is said to have been a mere 7,800 short tons. In fact, the word "petrochemicals" is supposed to have seen print for the first time as recently as 1942.

While the chemical industry has been regarded as a "wonder child" of the business world (expansion in this industry has averaged 10 percent yearly over the past 25 years as contrasted to a three percent annual growth for industry as a whole), the expansion of petrochemicals has been reckoned as 14 percent yearly.

By 1953 the output of petrochemicals as estimated by Dr. R. L. Bateman reached 12,650,000 tons, 22 percent of all chemicals made last year. Some sources hold that petrochemicals may already make up a full one-fourth of total chemical production. The value of these petroleum-based chemicals in 1953 showed up even greater: $3 billion out of a total of $6.1 billion for all chemicals.

Also comparing favorably was the investment in petrochemical plant, which was around 49 percent of the entire chemical industry in 1953.

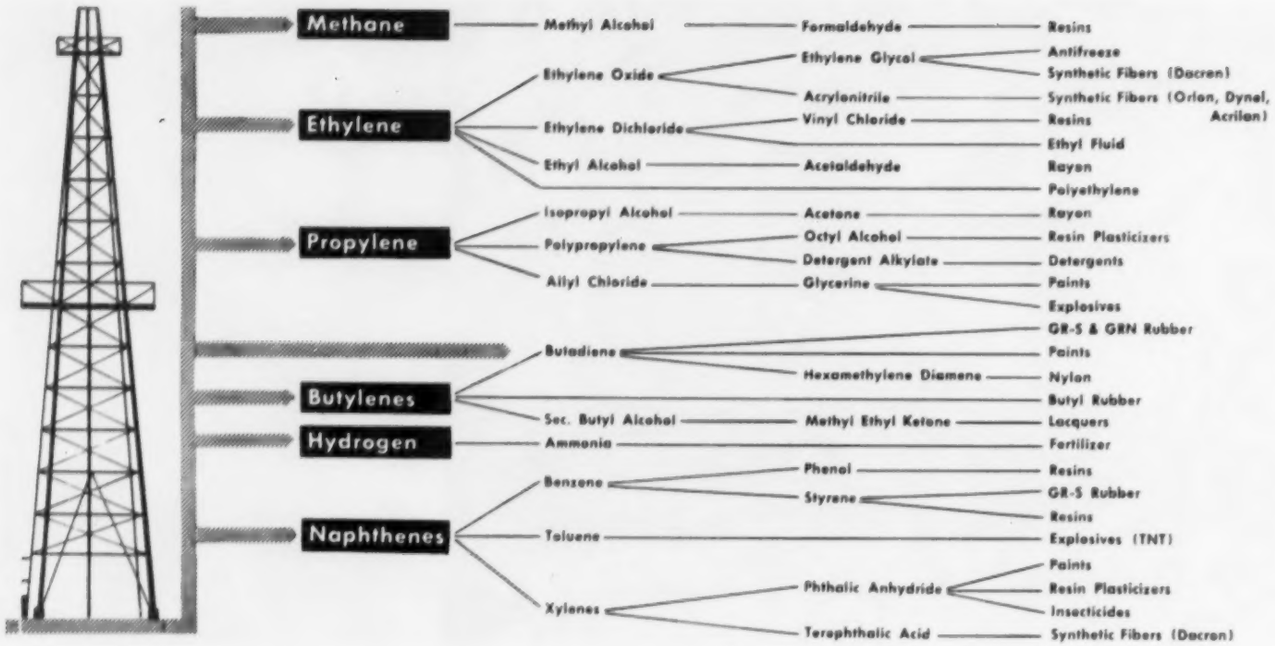
But this is enough recapitulation of the basic facts about the hyper-active growth of the petrochemicals industry. What are these particular chemicals, and how do they break down?

They may be expressed as "crudes" or "intermediates." U.S. Tariff Commission figures in Table I show the production of "crude" organic petrochemicals for 1953. From these "crudes" are usually derived one or more chemicals which represent "intermediate" states prior to the appearance of the final end product. "Intermediate" aliphatic chemicals made from petroleum sources in 1953 came to about 8,100,000 short tons, with a value of $2.4 billion.

Next in both volume and value were the "intermediate" aromatic petrochemicals, of which 1,100,000 short tons were produced in 1953 at a value of $400 million.

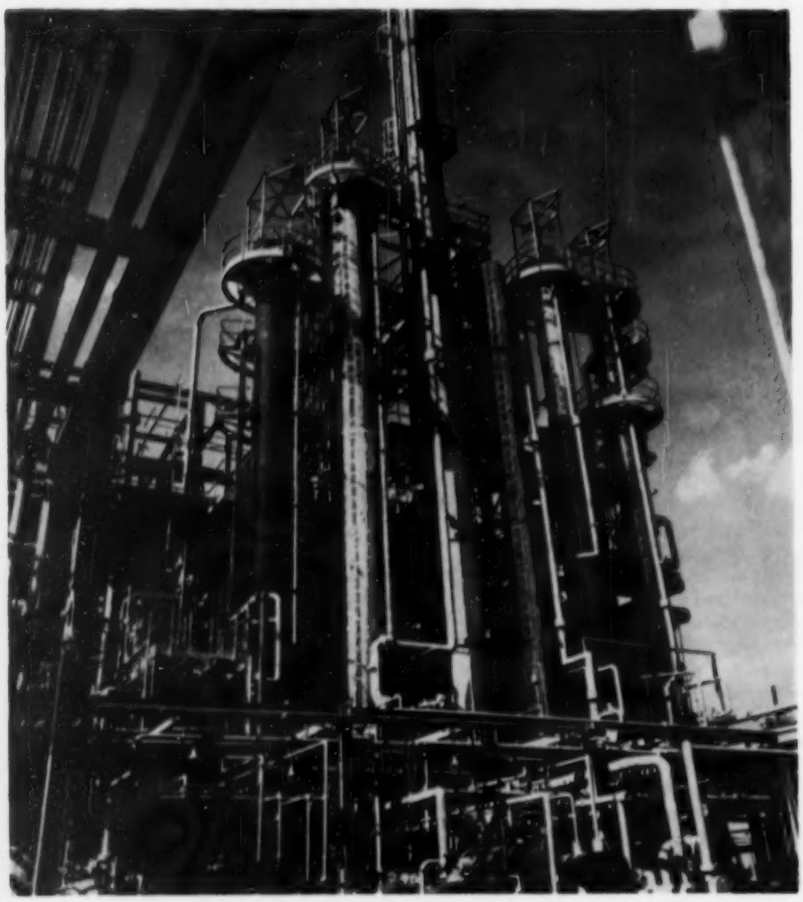
Although inorganic chemicals which can be made from petroleum cannot be divided so neatly between "crudes" and "intermediates," they include ammonia, carbon black and sulfur. Their total petroleum-derived production was 3,450,000 short tons in 1953, valued at $200 million. Individual production is calculated by Dr. Bateman as: ammonia, 1,800,000 short tons; carbon black, 800,000 short tons; and sulfur, 850,000 short tons.

The overall picture shows that the production of petrochemicals is a big-time, billion-dollar undertaking. In that pic-




# PETROCHEMICALS

*Ethylene unit of the du Pont Company's Sabine River plant near Orange, Texas. The plant employs more than 1,800 men in the manufacture of Alathon polyethylene resin, chemical intermediates for nylon and methanol. Photo courtesy du Pont Magazine.*



ture, oil companies hold a prominent spot. Of some 150 companies scheduled or now in petrochemical production in the United States, at least 56 are oil companies or their subsidiaries, with another nine companies jointly owned by oil firms and other organizations. A list of these and the "crude" and "intermediate" chemicals they make is given in Table II, "Oil Companies and Their Petrochemicals."

A word of caution needs to be added. It is an astonishing fact that less than three percent of the total volume of crude petroleum produced in the U.S. is going into petrochemicals (barely one percent consumed in primary products and two percent as fuel). The oil business is still busy turning out gasoline, diesel fuel, heating fuel, kerosine, liquefied petroleum gas, lubricating oils, greases, asphalt, and wax, among other basic if less novel commodities.

Clearly, petrochemicals, principally a byproduct of the refining of gasoline, are still a byproduct in the overall financial scheme of the oil industry.

The oil industry, therefore, needs to be careful in evaluating the significance of petrochemicals in its operations. The following comments are salient for looking at this significance from the standpoint of the oil business.

As often remarked, many of the chemicals now produced from oil and natural gas are not particularly new. It is authoritatively stated that all petrochemicals have been or could be produced from agricultural products, coal, other minerals such as shale, or even animal matter. Certain chemicals used in making nylon, for instance, can be produced from either

*(Continued on page 57)*

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THE EYES OF THE OIL INDUSTRY

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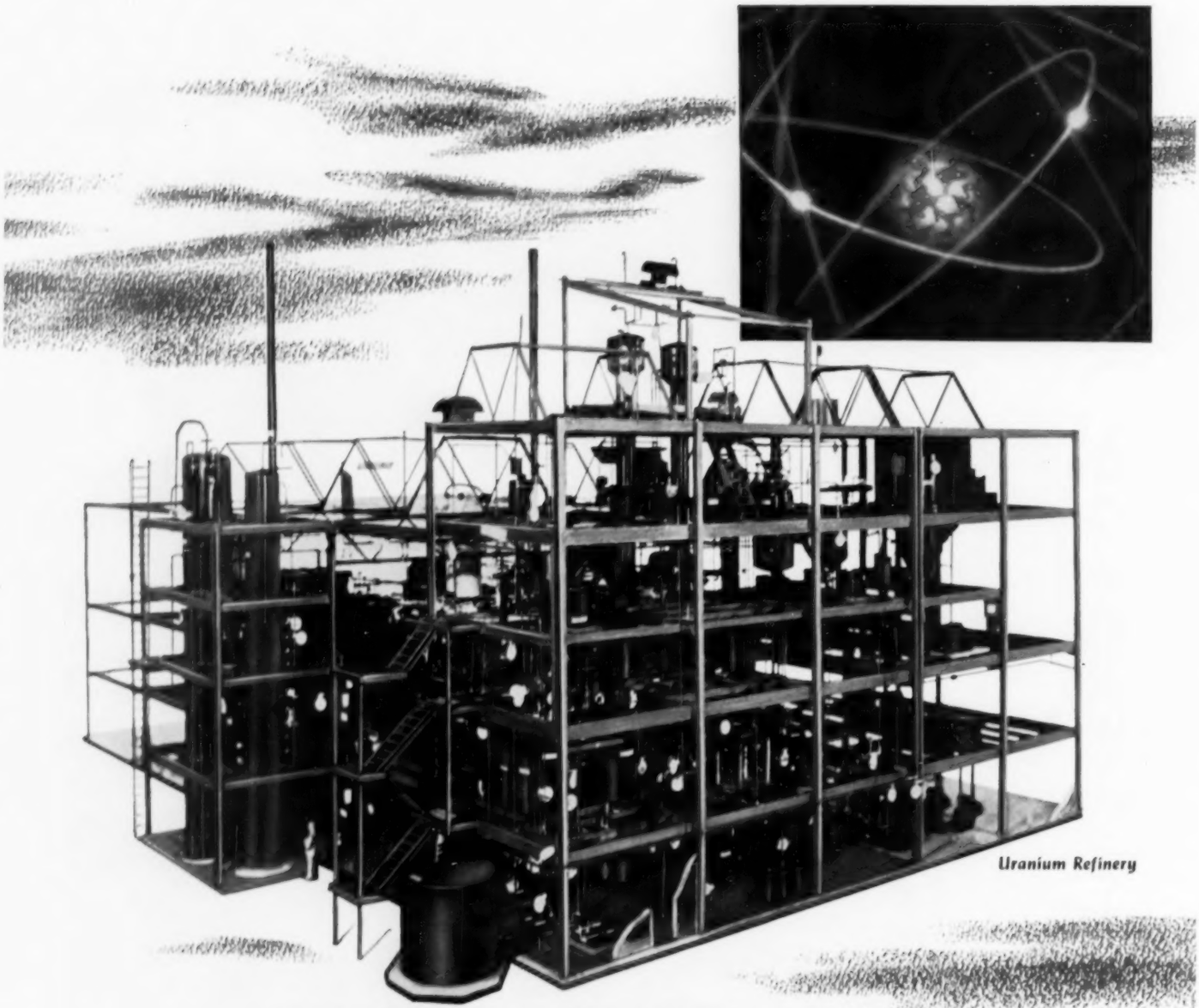

*Uranium Refinery*

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*Semet Solvay ethylene recovery unit which produces 50 tons per day of ethylene for the manufacture of polyethylene wax. Photo courtesy The Lummus Co.*

petroleum, coal, corn cobs, or cottonseed hulls. The importance of petrochemicals in this respect is the tremendous quantity that can be produced by oil men at a steady rate and consistent quality.

Petroleum, obviously, is not the only source of important chemicals. Nor is it certain that local oil and natural gas can forever hold a strong competitive position. Besides the never-to-be-forgotten question of a continuing domestic oil supply, at least one expert already feels that petrochemical production of aromatics will decline because of less costly production from coal. New processes may further put other coal-derived chemicals into more effective competition. At the moment, output from newly completed petrochemical facilities has temporarily caught up with the demand for some of the chemicals.

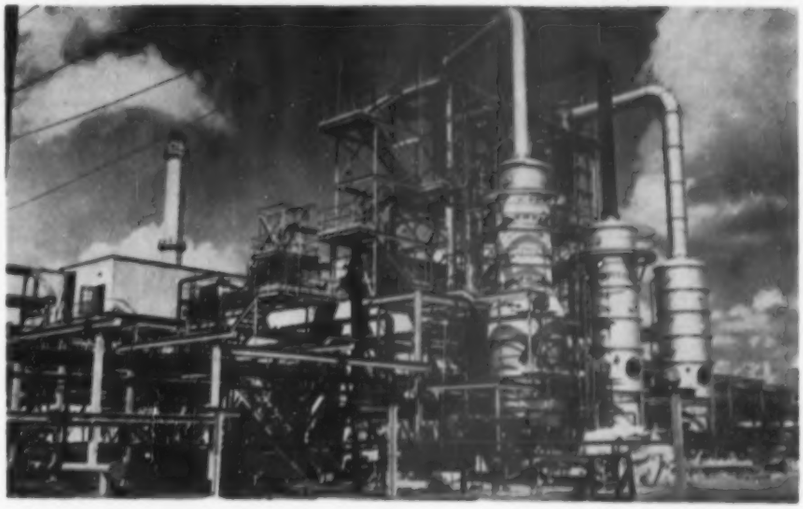
In spite of these economic factors, however, the future of petroleum-based chemicals is forecast as one of additional expansion. With 500,000 petrochemical compounds obtainable at this moment, scientists have stated their belief that 1,000,000 compounds are probably available.

As part of the study done for the President's Materials Policy Commission in 1952, the Standard Oil Development Co. surveyed the trends and requirements of the petrochemical industry from 1950 through 1975. The oil men estimated that total new investments in petrochemical plants would amount to $5.2 billion for the full 25-year period, exclusive of the investment already made by 1950. The projections were based on the construction cost index prevailing in June 1950. Although costs have gone up by more than one-fourth since then, it is nevertheless felt that the 1950-1975 investment requirement as stated is still adequate.

The survey for the commission was carried on in terms of "crude" rather than "intermediate" petrochemicals. Comparison with current reports on petrochemical production also satisfies the authors of the commission report that their growth projection of volume shows reasonably good agreement. The 1952 report listed 27,100,000 short tons as the annual production of "crude" petrochemicals in 1975. Between 1955 and 1975, the commission report indicated a growth in "crude" petrochemical production of nearly 170 percent.

By 1962, other authorities believe that fully half of all chemicals will have their origin in petroleum and natural gas. This is a doubling of proportion in a total which is still increasing.

Next year, it is expected that production of "intermediate" petrochemicals



*Adiponitrile area at du Pont's Victoria, Texas, plant. Butadiene and natural gas are raw materials.*

TABLE I

PRODUCTION OF "CRUDE" ORGANIC PETROCHEMICALS IN 1953

| Petrochemicals | Production (short tons) |
|---|---|
| ***Aliphatics*** | |
| Ethane | 72,300 |
| Ethylene | 1,067,900 |
| Propane and propylene | 1,219,500 |
| $C_4$ Hydrocarbons (including 1, 3-butadiene, n-butene, butane, isobutane) | 1,539,800 |
| $C_5$ Hydrocarbons (including pentanes, pentenes, isoprene and mixtures) | 19,100 |
| All others (including diisobutylene, dodecene, nonene, hydrocarbon derivatives, acetylene, hexanes, heptanes and heptenes, methane, octanes and octenes, and polybutene) | 241,600 |
| Total Aliphatics | 4,160,200 |
| ***Aromatics*** | |
| Alkyl aromatics, distillates, and solvents | 201,600 |
| Benzene (except motor grade) | 231,000 |
| Naphthenic acids | 11,600 |
| Toluene | 418,200 |
| Xylenes | 374,500 |
| All others (including crude cresylic acid, motor grade benzene, cyclopentane, dicyclopentadiene, petroleum phenols, sodium carbolate and phenate, and hydrocarbon polymers) | 12,600 |
| Total Aromatics | 1,249,600 |

**TABLE II—OIL COMPANIES AND THEIR PETROCHEMICALS**

| These Oil Companies | Produce the Following Petrochemicals | | | | | | | | | | | | | | | | Ownership |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Aliphatics | | | | | | Aromatics | | | | | | Inorganics | | | | |
| | Ethane | Ethylene | Propane-Propylene | C4 Hydrocarbons | C5 Hydrocarbons | Others | Alkyls | Benzene (non-motor) | Naphthenic Acids | Toluene | Xylenes | Others | Ammonia | Carbon Black | Sulfur | | |
| Aromatics Refining Co. | | | | | | | | | | | | | | | | | Wood River Oil & Refining Co. |
| Atlantic Refining Co. | | | √ | √ | | √ | √ | √ | | √ | | √ | √ | | √ | | |
| Brea Chemicals | | | | | | | | | | | | | | √ | √ | | Union Oil Co. of Calif. |
| Bryton Chemical Co. | | | | | | | | | | | | | | | | | Continental Oil Co. |
| Cities Service Oil Co. (Del.) | | | | √ | | √ | | √ | | | | | | | √ | | Cities Service Co. |
| Continental Oil Black Co. | | | | | | | | | | | | | | √ | | | Continental Oil Co. |
| Continental Oil Co. | | | √ | | | √ | | √ | | √ | | | | | | | |
| Cosden Petroleum Corp. | | | | | | | | √ | | √ | √ | √ | | | | | |
| Deep Rock Oil Corp. | | | | | | | | √ | | √ | √ | | | | | | |
| Eastern States Chemical | | | √ | √ | √ | √ | | √ | | | | | | | | | Eastern States Petroleum |
| Esso Standard Oil Co. | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | | | √ | | |
| General Petroleum Corp. | | | | | | | | | √ | | | | √ | | √ | | |
| Globe Oil & Refining Co. | | | | | | | | | | | | √ | | | √ | | Pure Oil Co. |
| Gulf Oil Corp. | | √ | √ | √ | | √ | | | √ | | | | | | √ | | |
| Hancock Chemical Co. | | | | | | | | | | | | | | | √ | | Hancock Oil Co. |
| Humble Oil & Refining Co. | | | | √ | | √ | √ | | | √ | √ | √ | | | | | |
| Indoil Chemical Co. | | √ | | | | √ | | | | | | | | | | | Standard Oil Co. (Ind.) |
| Kendall Refining Co. | | | | | | √ | | | | | | | | | | | |
| Lion Oil Co. | | | | | | | | | | | | | √ | | √ | | |
| Magnolia Petroleum Co. | | | | | | | | | | | | √ | | | | | |
| Neches Butane Products | | | | √ | | | | | | | | | | | | | Atlantic Refining Co., Pure Oil Co., Gulf Oil Corp., The Texas Co. |
| Oronite Chemical Co. | | | | | | √ | | | √ | | √ | √ | | | | | Standard Oil of Calif. |
| Pan-American Refining | | | √ | √ | | | | √ | | √ | √ | √ | | | | | |
| Pan-Am Southern Corp. | | | | | | √ | | | | | | | | | | | Standard Oil Co. (Ind.) |
| Petroleum Chemicals, Inc.[1] | | | | | | | | | | | | | | | | | Continental Oil Co., Cities Service Refining Corp. |
| Phillips Chemical Co. | | | √ | √ | √ | √ | | | | | √ | | √ | √ | √ | | Phillips Petroleum Co. |
| Cities Service Refining | | | | √ | | | | | | | | | | | | | Cities Service Co. |
| Continental Blacks, Inc. | | | | | | | | | | | | | | √ | | | Continental Oil Co., Continental Carbon Co. |
| Pennsylvania Refining Co. | | | | | | | | | | | | | | | | | |
| Signal Oil and Gas Co. | | | √ | √ | | | | | | | | | | | √ | | |
| Standard Oil Co. (Ohio)[1] | | | | | | | | | | | | | √ | | | | |
| Pure Oil Co. | | | √ | √ | | √ | | | | √ | √ | | | | | | |
| Republic Oil Refining Co. | | √ | √ | √ | | | | √ | | √ | √ | | | | | | |
| Richfield Oil Corp. | | √ | | | | | | | √ | | | √ | | | | | |
| Roosevelt Oil & Refining | | | | | | | | √ | | √ | | | | | | | |
| Seaboard Oil Co. | | | | | | | | | | | | | | | √ | | |
| Shamrock Oil & Gas Corp. | | | | | | | | | | | | | | | √ | | |
| Shell Chemical Corp. | | √ | | √ | | √ | | √ | | | | | √ | √ | √ | | Shell Oil Co. |
| Shell Oil Co. | | | √ | √ | | √ | | √ | √ | √ | √ | √ | | | | | |
| Sid Richardson Gasoline | | | | | | | | | | | | | | | √ | | |
| Sinclair Refining Co. | | | | √ | | √ | | | | √ | √ | √ | | | √ | | Sinclair Oil Corp. |
| Sinclair Rubber, Inc. | | | | √ | | | | | | | | | | | | | Sinclair Oil Corp. |
| Socony-Vacuum Oil Co. | | | | | | | | | | | | √ | | | | | |
| Standard Oil Co. (Calif.) | | | | √ | | √ | | √ | √ | √ | √ | √ | | | | | |
| Standard Oil Co. (Ind.) | | | | | | √ | | √ | | √ | √ | | | | √ | | |
| Stanolind Oil & Gas Co. | | | | | | | | | | | | | | | √ | | Standard Co. (Ind.) |
| Sun Oil Co. | | | √ | √ | | √ | | √ | √ | √ | √ | | | | | | |
| Sunray Oil Corp. | | | √ | | | | | | | | | | | | | | |
| Suntide Refining Co. | | | √ | | | | | | | | | | | | | | |
| Taylor Oil & Gas Co. | | | | | | | | √ | | √ | | | | | | | |
| The Texas Co. | √ | √ | √ | √ | | √ | | | √ | | | | | | √ | | |
| Union Oil Co. of Calif. | | | | | | √ | | | | | | | √ | | √ | | |
| United Carbon Co. | | | | | | | | | | | | | | √ | | | |
| Warren Petroleum Co. | | | √ | √ | | | | | | | | | | | √ | | |
| Wilshire Oil Co. | | | | | | | | | | | | | | | √ | | |
| Wynn Oil Co. | | | | | | | | | | | | | | | √ | | |
| **Joint Companies** | | | | | | | | | | | | | | | | | |
| Coltexo Corp. | | | | | | | | | | | | | | √ | | | Columbia Carbon Co., The Texas Co. |
| Ethyl Corp. | | √ | √ | | | √ | | | | | | | | | | | Standard Oil (Ind.), General Motors Corp. |
| Ethyl Dow | | √ | | | | | | | | | | | | | | | Ethyl Corp., Dow Chem. |
| Goodrich-Gulf Chemicals,[1] Inc. | | | | | | | | | | | | | | | | | Gulf Oil Corp., B. F. Goodrich Co. |
| Great Southern Corp. | | | | √ | | | | √ | | √ | √ | | | | | | Chicago Corp., Gulf Oil Co., La Gloria Corp., Pontiac Refining Corp. |
| Jefferson Chemical Co. | | √ | √ | √ | | √ | √ | | | | | √ | | | | | American Cyanamid Co., The Texas Co. |
| National Petro-Chemicals Corp. | √ | √ | √ | | | | | | | | | | | | | | National Distillers Prod. Corp., Panhandle Eastern Pipe Line Co. |
| Sid Richardson Carbon Co. | | | | | | | | | | | | | | √ | √ | | Sid Richardson, Odessa Natural Gasoline Co. |
| Texas Elf Co. | | | | | | | | | | | | | | √ | | | Phillips Petroleum Co., Godfrey L. Cabot, Inc. |

[1]Not yet in production

will reach 15,750,000 short tons. That's a jump of 3,100,000 tons over 1953 output for this group.

Further evidence of the continued expansion foreseen in the field of petrochemicals is the mounting interest displayed by other countries. Again, solid figures are not immediately available; however, the Standard Oil Development Co. makes this summary:

"The Germans have revived their prewar work. England is producing petrochemicals—so are France, Belgium, Holland and Italy. Synthetic detergents are finding increasing favor. Synthetic rubber production based on petroleum raw materials is planned by several countries. Petroleum-derived solvents, plasticizers, resins and fibers are expanding in world markets. Canada is growing in petrochemical production. An increasing need for nitrogen fertilizer, much of it synthesized from petroleum raw materials, is notable the world over."

Naturally, the pattern of U.S. participation in the production and consumption abroad of petrochemicals is impossible to determine at this point. Nor is the breakdown of participation in domestic production much nearer over the coming decades. One qualified observer declares simply, "From the earliest days of petrochemicals there have been chemical and petroleum interests in the business. In the past few years an increasing number of chemical companies have seen the possibilities in the raw materials derived from petroleum. But, at the same time, so have many oil companies. Who can say which group will grow larger?"

There remains one other major question on the importance of petrochemicals in the future. If petroleum were to find itself in more vigorous competition with other fuels—known, new or unknown—how much of an economic alternative would the production petrochemicals offer?

The same observer replies: "In spite of the anticipated growth in petrochemicals, they are not, and are not likely to be, a significant factor in the consumption of petroleum. If other forms of energy were to take away large portions of the petroleum markets, it is very doubtful whether petrochemicals, which now consume less than three percent of the petroleum refined and which are not expected to consume more than five percent in the next twenty-odd years, could be regarded as offsets to a loss of fuel markets."

Some individuals may be disappointed to realize the smallness of petrochemicals as a consumer of oil and natural gas. This fact does not detract from the contribution of petrochemicals to our physical well-being, nor from their increasing usefulness. Indeed, the manufacture of petrochemicals is claiming a great share of current oil industry attention and investment sums. This is likely to remain a basic pattern for a number of years to come.

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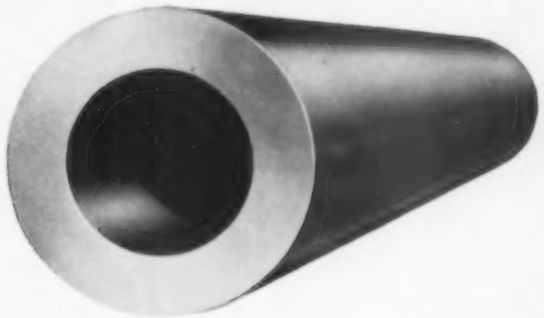
***Start with seamless tubing***



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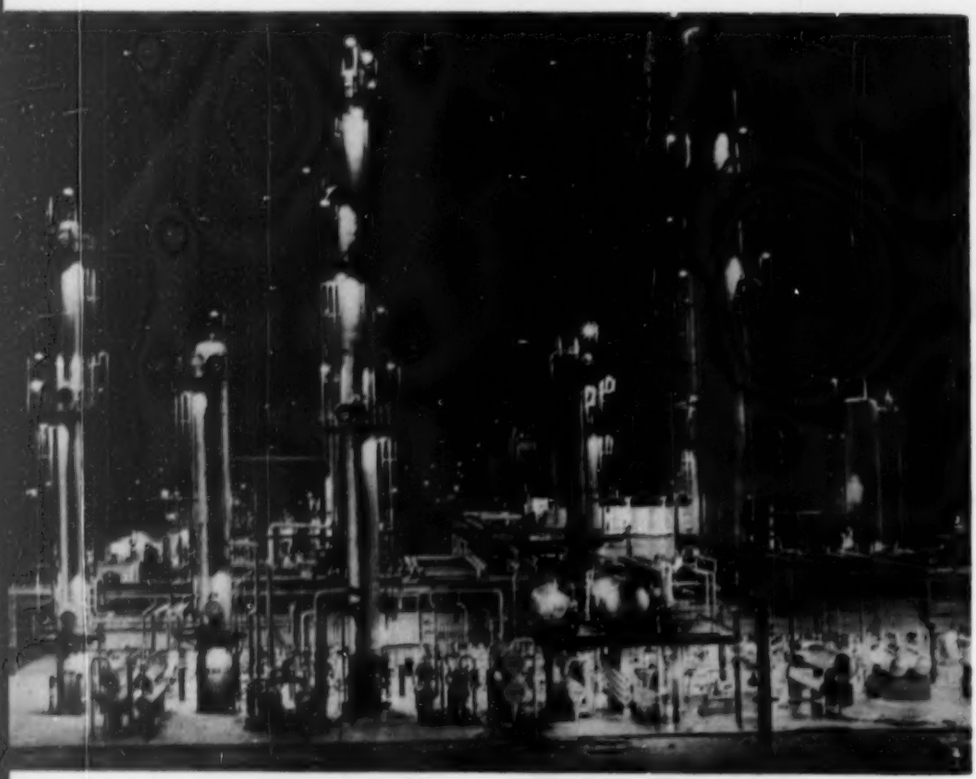
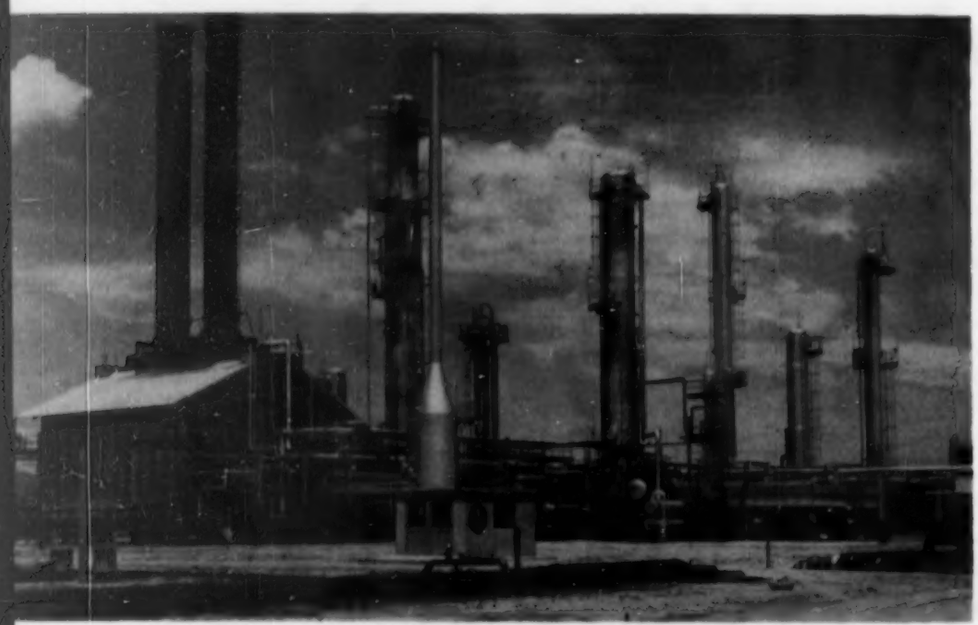
YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



*Exchangers and towers of South America's newest thermal refinery, a 10,000 b/d unit in Rio de Janeiro.*



*Process unit of 10,000 b/d thermal refinery in Rio de Janeiro designed for Refinaria de Petroleos de Manguinhos, S.A. From left to right: Combination furnace, towers and exchangers of process unit, with blow-down stack in left foreground. Photos courtesy The M. W. Kellogg Co.*

# Brazilian

**By R. G. Walker**

THE RACE between the Cubatao, Uniao and Manguinhos refineries to inaugurate their installations was won by the last-named on December 14, when Refinaria de Petroleo de Manguinhos, S.A. activated its 10,000-barrel refinery at Avenida Brazil, in the Federal District. The company's president, Sr. Peixoto de Castro, estimates the annual saving to Brazil in foreign currencies at US $5,400,000 annually. Production, he says, can be trebled within a short time if Congress cancels the clause prohibiting private refineries from increasing capacity. The project, designed and engineered by The M. W. Kellogg Co., was planned for completion in 13 months, but had to be carried out in eight in order to comply with the Petrobras Law, which forbids any extension of the time limit authorized for private refineries to reach the production stage.

Prior to dedication, all equipment had been "running-tested" on a cold-oil basis. Immediately after inauguration, crude oil was charged to the unit and hot-oil operation began. In this new integrated refinery, all major process operations have been co-ordinated into one combination refining battery where certain process steps share common pieces of equipment. All processes are thermal, no catalytic operations are involved.

The plant is designed to operate on East Venezuelan (Oficina) crude oil. The individual processes incorporated in the combination unit are: crude topping, light gas oil cracking, reduced crude visbreaking and light ends recovery. The unit has also been designed, however, for the future addition of naphtha reforming facilities and operation on Arabian crude oil.

The products of this over-all operation include fuel gas, propane LPGas, motor gasoline, various kerosine and gas oil fractions, and residual fuel oil. The plant was designed for the maximum yield of motor gasoline. The operating plan is to run crude for high gasoline yield with the minimum production of kerosine and diesel oil fractions.

In the integrated process operation oil streams flow hot from one stage to the next without passing through coolers or intermediate storage. At several points,

# refineries on stream

***Record-breaking construction speed made by builders of two privately owned Brazilian refineries to meet deadline set by Petrobras Law.***

there is heat exchange between streams in different process stages. Because of this plant design, substantial savings are effected in initial investment as well as in operating costs and labor requirements.

A design feature important to the successful long-term operation of this refinery is a closed cooling water system which permits the conservation of water made necessary by recurrent water shortages in the Rio de Janeiro area.

To protect the refinery against such water shortages, the closed system, incorporating a cooling tower, is arranged so that salt water can be used in place of fresh water. The salt water make-up facilities consist of an intake station, holding basin, pumps, chlorinating facilities, and other miscellaneous equipment. With this equipment, the refinery can utilize either fresh or salt water or a mixture of both.

The cooling tower in this system is a 3-cell unit with mechanical induced draft. Its water circulation rate is 11,000 gpm with 85°F exit water temperature.

The plant is designed to operate on East Venezuelan (Oficina) crude oil. It is expected to yield the following saleable products:

| | PARTIAL YIELD VOL. % | ULTIMATE YIELD VOL. % |
|---|---|---|
| Oficina Crude | 100.0 | 100.0 |
| LPGas | 3.0 | 5.0 |
| 10# RVP Gasoline | 55.0 | 69.0 |
| Kerosine | 7-10 | .. |
| Diesel Oil | 12-16 | .. |
| Fuel Oil | 23.0 | 27.0 |

The unit has also been designed, however, for the future addition of naphtha reforming facilities and operation on Arabian crude oil. The material balance for this proposed operation will include:

| | ULTIMATE YIELD VOL. % |
|---|---|
| LPGas | 6.0 |
| 10# RVP Gasoline | 64.0 |
| Fuel Oil | 25.0 |

Among the major process pumping equipment in this refinery is the visbreaker furnace charge pump, powered by a 235-hp turbine. Depending upon type of crude being refined, the capacities of this pump range from 8,300 to 11,600 b/d.

Plant steam is provided by two boilers each capable of producing 40,000 lb/hr of steam with 50 degrees of superheat at 175 psig at the superheater outlet. Bunker C is to be used for firing. Forced and induced draft is provided.

Refinaria de Petroleo de Manguinhos has a registered capital of 220 million cruzeiros (US $1,210,000) and has spent US $1,760,000 to date on construction and installation work.

The inauguration of the Manguinhos refinery was followed four days later, on December 18, at Capuava, Sao Paulo, by activation of the 20,000-barrel plant built for Refinaria e Exploracao de Petroleo Uniao (Soares-Sampaio group). This project was designed by Hydrocarbon Research and, in accordance with the Petrobras Law, also had to be completed by December 31, 1954. The refinery consists of a TCC cracking unit, gas recovery plant and catalytic polymerization unit.

The state-owned refinery at Cubatao, near Santos, was expected to begin working experimentally early in January. Its normal capacity of 45,000 barrels can be raised to 55,000 without further modification (see WORLD PETROLEUM, July 1951). The asphalt factory, adjoining the refinery, is planned for completion in November 1955.

Colonel Arthur Levy, president of Petrobras, speaking at a conference of military engineers at Rio de Janeiro on December 14, outlined the following program which, he said, could be put in hand immediately; Petrobras to build refineries at Rio de Janeiro and Recife or Belem, to process 60,000 and 26,000 barrels, respectively, and to raise the capacity of the Mataripe and Cubatao refineries to 15,000 and 70,000 barrels.

The existing plants will refine 80,000 barrels daily in 1955, or 52 percent of present requirements, and if the above program is carried out, Brazil will be practically self-supporting as regards refined products by the end of 1957. The cost, spread over three years, would amount to 25,000 million cruzeiros (US $1,375 million), including expenditure in foreign currencies, but by then the existing refineries would be saving US $100 million on imports of refined products.

Colonel Levy announced that Petrobras will install facilities to produce benzene, sulfuric acid, ammonia and other petrochemicals in 1955.

Referring to the staff problem, he said it is proposed to establish a permanent training center for operatives at Cubatao and one for drilling operations in Bahia. Brazil will thus be provided with two of the most essential elements for developing her oil industry. Other specialists will be engaged abroad as required.

Colonel Levy was followed at the conference by Minister Bittencourt Sampaio, who was responsible for the petroleum section of the SALTE Plan (see WORLD PETROLEUM, July 1950) which expired on December 31, 1954. Dr. Sampaio began by stressing the need to restrain consumption of petroleum products temporarily in view of the shortage of foreign currencies. The annual increase in the rate of consumption, he said, should not be allowed to exceed 15 percent. This means that Brazil, which now consumes 154,000 b/d, would require 264,000 b/d in 1958.

Parallel with this defensive measure, Dr. Sampaio recommends the following intensive 3-year program of prospecting, drilling and refining to be put in force immediately: (1) Teams of foreign specialists to be engaged, the necessary equipment being acquired without delay; (2) Petrobras to build four additional refineries, of 25,000 barrels daily, to be paid for by a surcharge on crude petroleum and to be completed by January 1958; (3) The privately owned refineries at Capuava and Manguinhos to increase capacity, Petrobras assuming responsibility for the new units if Congress fails to cancel the prohibitive clause in the Petrobras Law.

This scheme, its author claims, would cost US $446 million, but would render Brazil independent of imported refined products within the next four years.

As regards the expenditure involved in these plans, Dr. Plinio Cantanhede, president of the Petroleum Council, said recently that long-term credits have been offered both to the Council and to private enterprises to finance the purchase of equipment, either in the dollar zone or outside it.

# The MAN who would find OIL

THERE WAS NOTHING spectacular about the entry of Hugh Roy Cullen into the oil industry. Although a native of Texas, he was born twenty years before the first discoveries started the state on its road to leadership in American petroleum production. Land, cattle and cotton were the big industries in those days and young Cullen, who left school in his early teens to find a job and add to the family income, tried two of these before entering the field in which he was to attain his outstanding success.

In these earlier activities young Cullen demonstrated his ability as a trader. As a cotton buyer he made such a record that at the age of 22 he was able to set up in business for himself. In 1911 he moved to Houston, convinced by the location of the city and the completion of the ship channel connecting it with the Gulf of Mexico that a great commercial future was assured for the newly created port. Young Mr. Cullen became interested in the development of water front property and added a real estate line to his cotton export business. A logical next step was the writing of oil leases. For three years his leasing operations led mainly to a collection of dry holes, but it also contributed to a store of information useful to the wildcatter regarding surface indications pointing to the probable presence of oil underneath.

A first notable success of Cullen and his associates was in drilling at Pierce Junction, an area near Houston where half a hundred holes had been drilled without a sign of oil. Convinced, despite these failures, that oil was to be found in this salt dome formation, Cullen brought together a dozen local investors who put up $40,000 to take over and drill the lease that he had obtained from Gulf Oil Corporation. The well was brought in with a flow of about 2,500 barrels a day and continued to flow for two years. Later on, after it had ceased to yield, deeper drilling uncovered a field equal to the first. A whole series of later tests in the same area failed to develop any semblance of commercial production.

Cullen was near fifty and had spent a score of years studying the surface of Texas, familiarizing himself with the records of successful developments and checking available geological and geophysical information, before he scored the big hits which are the dream of every wildcatter, the hundred million barrel fields that not only make multimillionaires, but add significantly to the wealth and resources of the nation. As the list of these successes expanded, the story of Cullen luck became a legend. While nobody who has followed the history of oil would deny the part that good fortune has played in its growth, there is no question that hard work, intensive study and utilization of the tools and methods that science has made available have multiplied the possibilities of locating the hidden treasures of the earth and Cullen brought into play all of these factors.

The attainments of Roy Cullen as a remarkably successful finder and producer of oil were sufficient to make his name well known in Texas, but to the outside world it was his unique manner of disposing of his wealth that aroused astonishment and admiration. As his means grew his benefactions (and those of his family) to the causes of health and education increased. His most conspicuous philanthropy has been the Cullen Foundation, with resources of $160,000,000, dedicated to medical and educational work throughout Texas. Almost single-handedly he raised the University of Houston to a place among the high ranking institutions of the state and provided the Texas city with one of the most modern and best equipped medical centers in the entire country. On one occasion he astonished his fellow citizens and the country at large by giving away four and a half million dollars to four hospitals representing four separate church organizations within a space of 48 hours, a demonstration all the more noteworthy since Cullen himself is not affiliated with any of the numerous denominational sects that flourish in the south. To all his princely gifts no restrictions are attached. Cullen's own explanation of the reason for leaving the recipients of his gifts free to dispose of them in such ways as they consider most helpful is typical of the man.

"Lillie (his wife) and I are selfish about our giving," he said on one occasion. "We want to see our money spent so we can enjoy the spending. A lot of our friends are less selfish — they are willing to let their heirs and trustees distribute their money after they are dead and gone and won't even get a kick out of giving it away."

Mr. Cullen is a rugged individualist, a strong upholder of the rights of men and a constant battler against the "creeping socialism" that he saw spreading over the country under policies of the New Deal and the Fair Deal. For years his battles against these theories led far more often to defeat than to victory, but the size of the opposition or the smallness of his own forces never deterred Roy Cullen from waging battle for any cause that he believed in.

It was inevitable that the Cullen biography should be written sooner or later, and the authors of the newly published volume, *Hugh Roy Cullen — A Story of American Opportunity*, have produced a readable and inspiring account of a most unusual man. These authors, Ed Kilman and Theron Wright, are newspaper men long acquainted with Mr. Cullen and with the events of his career. It is evident, however, that a rather tight rein has been held over them by the subject of their narrative in describing the details of his philanthropic activities.

*Hugh Roy Cullen — A Story of American Opportunity*, by Ed Kilman and Theron Wright; 360 pages, with illustrations; published by Prentice Hall, New York, 1954; price $4.50.

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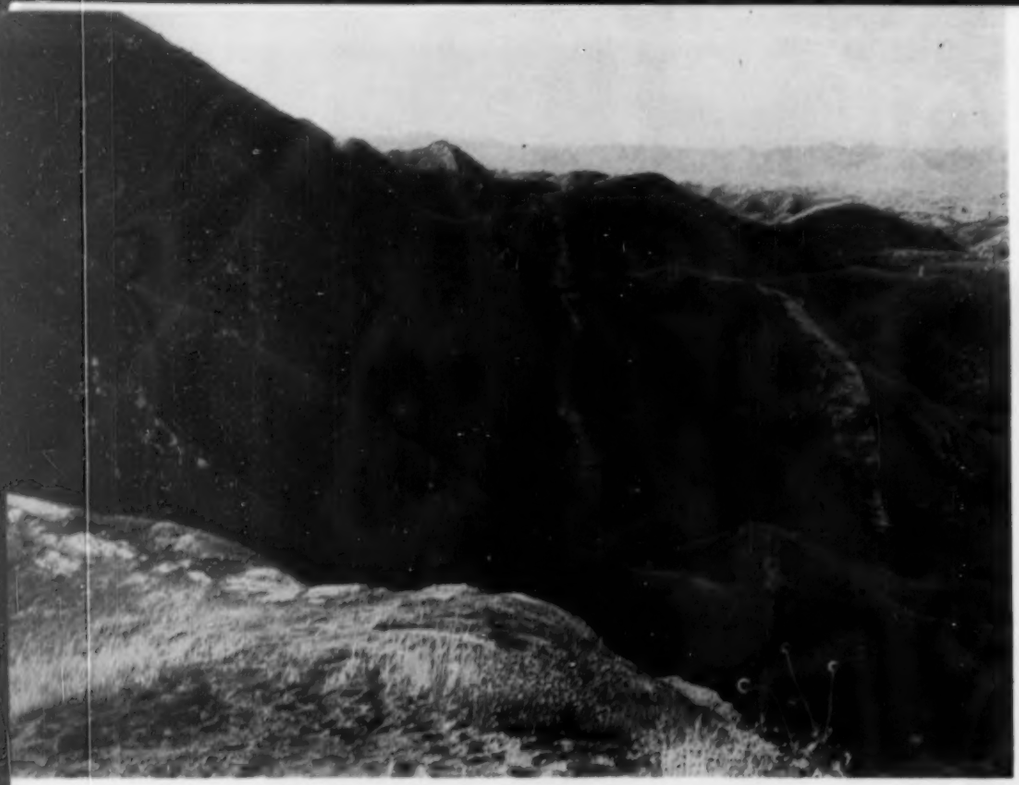


*Typical oil field country in southern Iran.*

*Theodore Wild, a geologist and natural gas engineer for the U. S. Federal Power Commission, is a native of Iraq and has spent many years in Iran with the government and with private industry. He is now a naturalized citizen of the United States. Educated in the United States at Beloit College and Columbia University, Mr. Wild worked for the U. S. Geological Survey, as a geologist with the Trans Iranian Railroad construction, and with the Anglo-Iranian Oil Co. He was technical adviser to the Bureau of Irrigation in Iran, to the Bureau of Concessions and Petroleum and finally Director General of the Department of Mines in Iran in 1944 and 1945. He has written several articles, both in English and Persian, and is a member of several professional societies. He is listed in Who's Who in Engineering and in American Men of Science.*

# The evaporites of the oil fields of SOUTHWEST IRAN

*Oil pipe lines in the Tembi area.*

**By Theodore Wild**

INFORMATION on the old fields of southwest Iran in sparse, yet nearly ten years of geological studies in the Persian Gulf area suggests that intimate familiarity with the evaporites of southwest Iran is definitely one of the main criteria for success in those old fields. Knowledge of their deposition, their occurrence and, above all, their behavior under local conditions is imperative in all drilling operations. To make successful locations requires long experience of the vacillations of evaporites, particularly when they are under pressure and temperature. It is hoped that this brief discussion will prove useful to those who will now reactivate those oil fields.

The evaporites of the oil fields of southwest Iran consist mainly of rock salt and anhydrite and also of some gypsum nodules in associated sediments. Evaporation and deposition is going on right now in the various salt lakes of the Iranian Plateau. A notable example is Lake Urumia in the northwestern part of Iran. This salt lake has been shrinking for years and it has been observed that there the evaporites consist of salt and crystalline gypsum (alabaster).

Lower Fars (Lower Miocene) was the geologic time when the evaporites of the oil fields of southwest Iran were deposited. Whether their deposition was due to the withdrawal of the sea and the creation of isolated bodies of water, which were more readily evaporated, or whether their deposition was due to the concentration of dissolved chemicals and consequent oversaturation of the body of water in that arm of the sea and the eventual precipitation of the evaporites is still a controversial subject. However, the second alternative is more favored because the deposits seem to be practically continuous in the Persian Gulf-Karun-Tigris-Euphrates basin.

The beginning of the formation of the anticlinal flexure in the Asmari limestone reservoir (Lower Miocene-Upper Oligocene) was perhaps pene-contemporaneous with the deposition of the evaporites. The topmost part of the Asmari limestone, which immediately underlies the chemical deposits, gradually changes from a dirty grey gypsiferous limestone to muddy dirty sour-tasting anhydrite.

Such gradual lithologic change can best be observed in the Gach Saran oil field. No break between the reservoir limestone and the overlying caprock has been observed in that field or in any other oil field of southwest Iran.

The Lower Miocene chemical deposits are quite widespread throughout the Persian Gulf - Karun - Tigris - Euphrates basin. They occur as far south as the Island of Qishm, at the mouth of the Persian Gulf, and as far north as the Kirkuk-Mosul oil fields of northern Iraq, a distance of about one thousand miles. Of course, they also occur in all the oil fields of southwest Iran, which lie halfway between Qishm and Mosul.

The deposits vary in thickness in different areas. In the Lali oil field, they reach an average thickness of 6,000 feet, while in parts of the Masjed-i-Sulaiman oil field, which lies only 20 miles to the southeast of the Lali field, they are only several hundred feet thick. This variation in thickness could conceivably be due to the original deposition and the original variation in the depth of the basin. However, such abnormal thicknesses of 12,000 feet of evaporites as occur in the Zeloi area, which is only five miles south of the Lali oil field, are probably at least partially due to the squeezing of the chemical deposits and their consequent piling and wadding up as explained below.

*The Behavior of Evaporites:* The considerable overburden and the regional tectonic forces subject the evaporites of the oil fields of southwest Iran to compression. The compressive forces, the depth of the deposits, as well as the frictions which may thus be created, cause high temperature. Under such stresses and temperatures, evaporites behave like plastics, highly incompetent and almost fluid. Because of such characteristics, these deposits are squeezed out along the line of least resistance when regional tectonic forces compress them against the massive Asmari reservoir limestone.

The chemical deposits of the oil fields of southwest Iran are sandwiched between several thousand feet of overburden of marls, sandstones and conglomerates of Miocene and Pliocene age and the underlying formidable Asmari limestone. The line of least resistance is neither upward through the impervious marls and rigid sandstones and conglomerates nor is it downward through the massive Asmari limestone; it is rather along the zone of the evaporites.

The direction of tectonic forces in Iran is known to be from the northeast. Therefore, the squeezing usually happens along the northeastern flank of the Asmari reservoir. So the subsurface behavior of the evaporites in southwest Iran is practically to flow in a westerly or southwesterly direction and pile up beyond the subsurface crest of the Asmari fold. When such flow and piling up is repeated enough times, the evaporites eventually form their own pseudo-highs at some distance west of the actual subsurface high of the Asmari reservoir. So, the Asmari reservoir and its structural high should be looked for at some distance east of northeast of the surface highs formed by the chemical deposits.

Generally speaking, the oil fields of southwest Iran occur in a rough and wildly undulating sea of grey gypsum. Here and there escarpments of Middle Fars (Middle Miocene) fossiliferous marls or Upper Fars (Upper Miocene) sandstones stand out as beacons over the vast forbidding panorama. However, an intimate knowledge of the subsurface behavior of evaporites will enable one to translate the observable ocean of confusion and disorderliness into some recognizable system and pattern of behavior.

*Fissures and Fractures Factors of Productivity:* The northwest-southwest trend as well as the asymmetrical shape of the structures of the oil fields of southwest Iran are considered to be primarily due to the direction of the regional tectonic forces. These forces have also played the leading role in fracturing and in fissuring the rigid Asmari reservoir limestone. It is along such fissures and fractures that the productivity of the reservoirs has proven to be prolific. The main fracturings occur along the crest and along the steeper southwest flank of the reservoir limestone, where the structure is subject to stresses of various kinds. They do not occur as intensively or as extensively along the northeastern flank, where the reservoir is subject mainly to compression. These structural patterns, consequent to regional tectonic forces, were confirmed in the laboratory by a series of experiments carried out by the author in 1935.

One of the most promising oil fields in southwest Iran is the Gach Saran field, which was surveyed for development in 1936 and was later exploited in World War II when the pipe line brought its oil to Bandar Maashur on the Persian Gulf. Earlier exploratory drilling on the eastern flank had proven the presence of oil, but the reservoir was found to be too tight and therefore its immediate commercial development was considerably delayed. Further exploratory drilling on the western flank, which took place since 1937, proved the reservoir to be a prolific producer. These later holes went through fissures and fractures where the entire drilling mud was lost repeatedly.

In conclusion, it is hoped that this brief discussion, which points out some of the subsurface characteristics of the oil fields of southwest Iran, will prove useful to other investigators of the area.

*View of No. 1 well, Lali field.*

# CANADA

## Imperial Oil Promotion

George Brydon, who has been with Imperial Oil Ltd. for 24 years, has been appointed assistant manager of refining co-ordination in the manufacturing department. He succeeds John Hough, who has retired.

Mr. Brydon was loaned to the St. Clair Process Corp., a subsidiary of the government-owned Polymer Corp. set up for the manufacture of synthetic rubber. At the end of the war he came to the manufacturing department at the company's executive offices in Toronto. His last position was co-ordinator of cost, economics and budget.

Mr. Hough had been with Imperial almost 42 years when he retired. His first job was as a clerk at Fort William when he came from his native England in 1912. He also worked at Sarnia refinery and was with International Petroleum Co. at Talara, Peru, for two years before becoming a statistician in the manufacturing department in Toronto in 1932. In 1946 Mr. Hough was appointed co-ordinator of refinery operations and economics survey and, four years later, moved into the position from which he retired—assistant manager of the refining co-ordination division.

## Saskatchewan Discovery

Imperial Oil Ltd. has a new light oil discovery in southeastern Saskatchewan about 3 miles south of Alida and some 33 miles southeast of the recent Tidewater discovery at Ajax White Bear #4. Both finds are in the Williston Basin area of the province.

Oil of 37 degree gravity API was recovered in a zone of approximately 60 feet in which there was oil and no water. Legal description of the Alida well site is center LSD4, 35-5-33 W 1st.

## Shell Plans Refinery Expansion

A $4 million expansion program at Shell Oil Co. of Canada's Montreal East refinery is announced by Dr. D. M. Morrison, vice president, manufacturing. The extensions, scheduled for completion late in 1955, are intermediate steps in an overall program designed to ultimately increase the refinery's capacity from 44,000 to 55,000 barrels of crude oil per day.

The current expansion includes the addition of a new vacuum flasher and an increase in the capacity of the catalytic cracking unit from 16,500 to 19,500 barrels per day. A contract for the construction of the vacuum flasher has been awarded to Arthur G. McKee Co. of Canada Ltd., a firm which shared in the last major expansion and modernization program at the refinery in 1950. Work on the catalytic cracker is being undertaken by Shell's engineering staff.

The cat cracker capacity is being increased through the installation of a new furnace and a novel internal regenerator cooler, the first of its kind in Canada. Upon the completion of the vacuum flasher the combined capacities of the new and existing units will be raised to 32,500 barrels daily.

Shell's Montreal refinery was built in 1932 with an initial capacity of 5,000 barrels per day. In 1950 a multi-million dollar expansion was completed which equipped the refinery with the latest type of catalytic cracking unit and new flashing and enlarged polymerization units. Included in the expansion were new laboratories, maintenance shops, additions to blending and distribution facilities, 750,000 barrels of tank storage, extension of road and rail facilities and new office buildings.

## Four Catformers Licensed

The Atlantic Refining Co. announces that four additional refineries have been licensed to use the Catforming process developed by Atlantic for the production of high octane gasoline. British American Oil Co. Ltd. will install a 13,000 b/d Catformer at Montreal and a 2,000 b/d Catformer at Calgary. Completion of the Montreal unit is scheduled for late 1955, while the Calgary unit will start up in February 1955. The Husky Oil and Refining Co. Ltd. will install two 1,000 b/d Catformers, one at Moose Jaw and one at Fort William. These units are scheduled to start up in July 1955.

Completion of these four units along with four others now under construction and the 14 now operating will result in 22 refineries using Atlantic's Catforming process by the end of 1955.

## B-A to Build Platformer

British American Oil Co. will build a $3 million catalytic reformer at its Montreal East refinery. The new unit will process about 13,000 barrels a day of straight run naphtha and this new production will be used as a high-octane blending agent in gasolines marketed by British American Oil.

The catalytic reformer, to be built by the Lummus Co. Canada Ltd., is scheduled for completion in late 1955. Present daily crude oil throughput capacity at the company's Montreal East refinery is 45,000 barrels.

## Let Building Contract

Contract for Imperial Oil's new executive office building in Toronto has been awarded to Pigott Construction Co. Ltd., of Hamilton and Toronto, with Canadian Comstock Co. Ltd. as sub-contractor for the mechanical and electrical trades. Site of the 19-story structure, which is scheduled for occupancy early in 1957, is on St. Clair Avenue near Avenue Road.

## Husky Acquires Trans Empire's Moose Jaw Refinery

Lawrence W. Lee, executive vice president of Husky Oil & Refining Ltd., and John D. Boyd, president of Trans Empire Oils Ltd., announce the purchase by Husky of Trans Empire's Moose Jaw refinery in Saskatchewan. Mr. Boyd stated that this company is primarily interested in the production of crude oil, and is retiring from the refining field in order that all its efforts may be concentrated on a program of exploration and development on its extensive land holdings in Alberta, Saskatchewan and British Columbia.

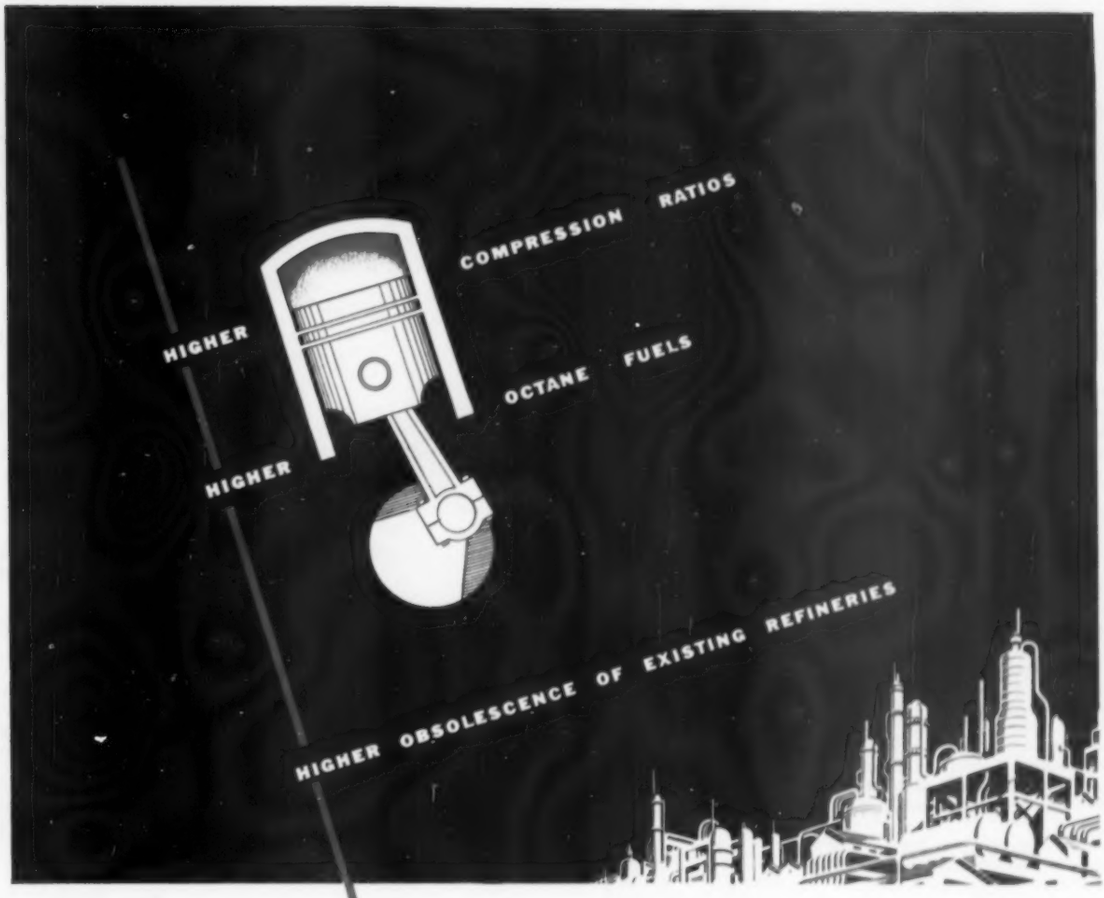
The purchase of the Moose Jaw plant, following the acqusition of the Fort William refinery announced last week, brings to three the number of refineries now owned and operated by Husky, with a present total capacity of 12,500 barrels per day.

Plans for the expansion of the Moose Jaw refinery from its present 2,000 barrels to 5,000 barrels daily capacity will be implemented when Husky takes possession. Projected capacity of the three plants following completion of present plans will be 18,500 barrels per day.

## Smiley Field Gets Outlet

Mid-Saskatchewan Pipe Lines Ltd. has started construction on a gathering system at the Smiley oil field and on a 24.4-mile transmission line from the field to the Kerrobert pump station of the Interprovincial Pipeline Co. Storage is being installed at the point in the line where the diameter changes from six to eight inches, which will enable producers in the Eureka field to handle their oil through the pipe line as well, with only a short road haul involved. The six-inch line will run from the Smiley field to this point, a few miles from the Eureka field, and from there the eight-inch line will run to the Kerrobert pump station at Ermine, Saskatchewan.

*Shell Oil Company of Canada's Montreal East refinery, which is to be enlarged in capacity from 44,000 to 55,000 barrels of crude oil daily.*

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*M. S. Lent*

## Petrofina Building Houdriflow

The tallest Houdriflow catalytic cracking tower ever built in Canada is now being erected at the Canadian Petrofina Ltd. refinery being constructed in Montreal, it is announced by The Lummus Company Canada Ltd., general contractors for the plant.

Canadian Vickers Ltd. is building and erecting the Houdriflow unit for Lummus. When completed, it will be 285 feet high with a maximum diameter of 24 feet. The tower is being shop-fabricated in 16 sections and will be trucked to the plant site.

To lift the sections in place, the highest guy derrick ever used on this continent has been erected at Pointe Aux Trembles. The derrick has an overall height of 425 feet. The mast (215 feet high) and boom pivot on a tower of open girder construction 210 feet high and 84 inches square.

As now assembled, the derrick can lift 80 tons a height of 400 feet. Heaviest lift on this job is 67 tons. It is guyed to four concrete deadmen 17 feet square and imbedded deep in the earth. A tension of 10 tons is maintained on each guy by means of three winches anchored in each deadman.

Lummus announces that work is well under way on the refinery gas plant and the hydrodesulfurization unit, and that completion of all work on the Petrofina refinery in Montreal is scheduled for mid-1955.

## Foster Wheeler To Build at Halifax For Imperial

Imperial Oil Ltd. has authorized Foster Wheeler Corp. (in collaboration with Foster Wheeler Ltd. of Canada), to proceed with the design and construction of extensive process and offsite facilities at its Halifax, Nova Scotia refinery.

The process units included in this modernization program are a 41,625 b/d two-stage crude distillation unit, a 27,000 b/d Model IV fluid catalytic cracking unit, light ends absorption and fractionation facilities, and catalytic polymerization and caustic neutralization units.

Foster Wheeler will also provide a steam generation plant and power, air and fuel distribution systems.

## Returns to Edmonton

Welden Martin, vice president and general manager of Weatherford Ltd., has resumed his duties in Edmonton, Alberta, after a six month's leave of absence to help conduct sales clinics for all of Weatherford Oil Tool Company's branches in the United States.

## Imperial Engineering Building Begun

Imperial Oil Ltd. has let a contract for the company's new ultra-modern engineering building at Sarnia. A temporary war-time structure has been in use since 1946.

## Trans-Canada Appoints Lent

M. S. Lent, formerly with Imperial Oil Ltd. for 28 years, has been appointed purchasing agent with Trans-Canada Pipe Lines Ltd. His headquarters will be in Calgary. Mr. Lent started with Imperial Oil in the company's purchasing department in Toronto and in 1949 was transferred to Edmonton and the company's regional purchasing department. He moved to Calgary in 1950 to Imperial's western division producing department and later joined the Alberta regional producing department when these two were amalgamated.

J. W. Tomlinson has been appointed assistant sales manager of Trans-Canada Pipe Lines Ltd. He resigned as general manager of the Saskatchewan Power Corp. to accept the appointment, and will be located at Trans-Canada's sales headquarters at Toronto. Under A. P. Craig, vice president in charge of sales, Mr. Tomlinson will negotiate contracts with natural gas distributors and with those large industrial users located outside the territories covered by the distributors along the 2,200-mile link between the Alberta gas fields and central and eastern Canada.

## Drilling Program for Peace River Area

An agreement announced from Calgary directly after the first of the year by W. D. C. Mackenzie, manager of the western producing division of Imperial Oil Ltd., provides for an extensive exploration of oil and gas possibilities in the Peace River district of British Columbia. Under its terms, Imperial is obligated to drill five deep wells and other shallower ones during the next three years in an area of 2,500,000 acres at a cost calculated at $9,000,000.

The four companies holding leases in the area to be tested are Pacific Petroleums Ltd., Canadian Atlantic Oil Co. Ltd., Peace River Natural Gas Co. Ltd., and Sunray Oil Co. Some of these companies hold already discovered production in the district which they will retain. Production developed by Imperial's operations will be shared between that company and the lease holder on terms to be arranged in each case.

## Texaco Gets Pembina Well

Texaco Exploration Co. has made its first oil discovery in the Pembina area. The discovery well is on an 87,000-acre tract under reservation to Texaco Exploration Co., and in which McColl-Frontenac Oil Co. has a working interest.

The site of the well is approximately 40 miles south of the original Pembina discovery well. It is the first well drilled by Texaco in the Pembina area and is on one of the two high priced tracts in the area bid in by the company early in 1954. The well was tested at a depth of 6,099-6,112 feet and flowed at a rate of 22 barrels per hour of 40 gravity oil on a three hour test, through a one-quarter inch choke after hydrafracing.

## Shell Executives Visit West

Recent visitors to the Shell Oil Co. of Canada Ltd. gas processing plant at Jumping Pound were Sir Francis Hopwood, managing director and chairman of Shell Oil Co., H.S.M. Burns, president, Shell Oil Co., and W. M. V. Ash, president, Shell Oil Co. of Canada Ltd. The executives were in the Calgary area to review company operations and plan future developments.

## Ralph Hamilton

Ralph Hamilton, of Vancouver, former engineering manager of Canadian Bechtel Ltd. on the Edmonton to Vancouver Trans Mountain Oil Pipeline, died of a heart attack December 26 while on a holiday visit to Menlo Park, Calif. He carried out some of the original surveys for Bechtel along the pipe line route. He later resigned from Bechtel and formed Ralph F. Hamilton Ltd., an engineering firm with offices in Vancouver.

*J. W. Tomlinson*

## Canadian Bechtel Awarded Imperial Contract

A contract to install new equipment to produce higher quality gasolines at Imperial Oil's Ioco refinery near Vancouver has been awarded to Canadian Bechtel Ltd. R. W. Dunlop, manager of the engineering division of Imperial's manufacturing department said work will begin immediately.

The installations, consisting chiefly of a catalytic polimerization unit and a naphtha fractionator, are a major part of a $2,900,000 program scheduled for completion next September.

Contracts for other portions of the work, including storage tanks and other off-site facilities, will be awarded later.

The "cat-poly" unit will be used to make high octane gasoline from certain types of light petroleum gases which are normally too volatile for use as motor fuel. The naphtha fractionator will be used to separate gasoline and furnace fuel components.

The new installations will represent the biggest development at Ioco since the completion of a $13,500,000 construction program there in September 1953.

## New Supply Store

The National Supply Co. Ltd. has opened an oil well supply store at Drayton Valley, Alberta, in the heart of the new Pembina field. The store will be the fifth operated by the company in Alberta. The company also has four stores in Saskatchewan. Stanley R. Hill has been appointed manager of the new store. It is under the supervision of A. Douglas Foulds, district manager.

## Appointed to Saskatchewan Oil Post

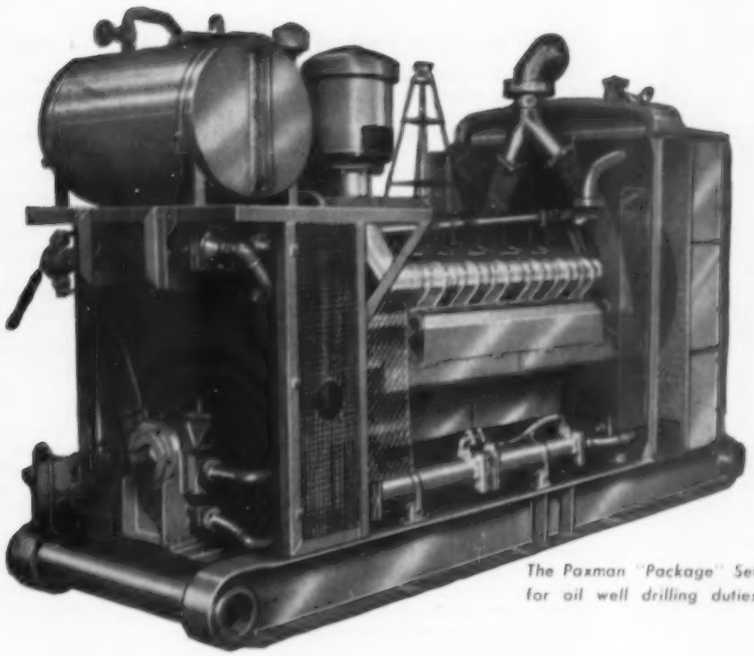
H. B. Sawatzky has been appointed geophysicist in the petroleum and natural gas division of the department of mineral resources of the Saskatchewan Public Service Commission. The position is a newly created one. Prior to his present appointment, Mr. Sawatzky was employed with the Petty Geophysical Engineering Co., Swift Current, from 1950 to 1954.

## Joins Mid-West Refineries Board

David Smith, of Edmonton, Alberta, has been elected to the board of directors of Mid-West Refineries, Inc. of Grand Rapids. Mr. Smith was formerly associated with Superior Oil Co. and is presently engaged in oil production and exploration in Canada.

## Royalite Appointment

K. S. C. Mulhall has been appointed secretary-treasurer of Royalite Oil Co. Ltd. For the past three and one-half years he has been manager of a Royal Bank of Canada branch in Calgary.



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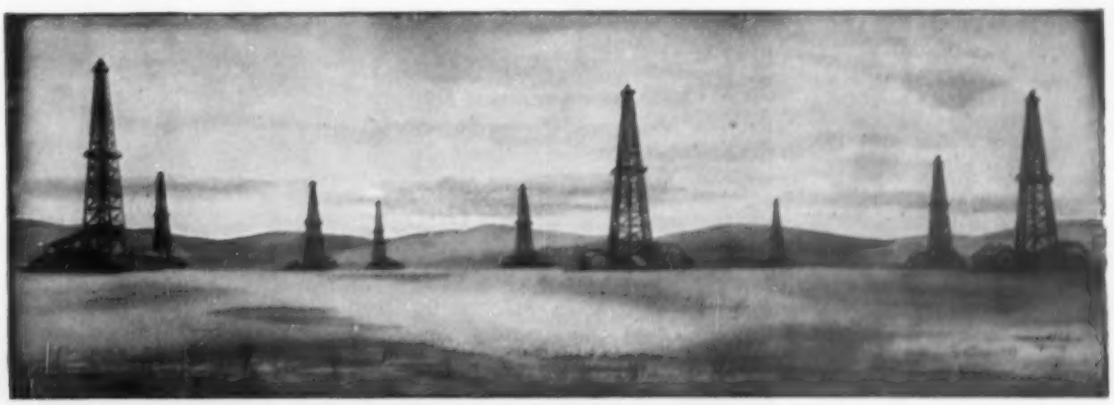


# BRITISH OIL NEWS

By E. Lawson Lomax

## New British Motor Oils

Following modern American practice, Shell-Mex and B.P. Ltd. have introduced two new universal summer and winter grade motor oils, of such characteristics that the same oil can be used in most makes of cars whatever the temperature conditions.

By the addition of certain oil-soluble polymerized organic compounds to normal motor oils already blended with detergents and anti-corrosive compounds, oils are obtained with a flatter viscosity curve, i.e., they flow as freely at low temperatures as winter oils, but when the engine is hot the oil in the bearings and on the cylinder walls is as thick as normal summer grade oils.

Claim is made that these oils flow so freely under the coldest starting conditions that overall wear, which in such states is at its greatest, is reduced by 80 percent and engine life can be doubled.

An extensive road test program has shown that for short journeys the saving in fuel consumption can be as high as 12 percent and that in service involving an average proportion of long journeys the saving is between five and 10 percent.

It is also claimed that carbon deposits in the combustion chamber are reduced and therefore greater mileages can be made before the necessity of decarbonizing.

The oils are marketed by Shell-Mex and B.P. Ltd. under the trade names of B.P. Special Energol Visco-Static motor oil and Shell X-100 10W/30 motor oil.

The oils are not recommended for two-stroke engines.

## Anglo-Iranian Announces Name Change

Anglo-Iranian Oil Company, Ltd. announces its change of name as of December 17, 1954 to The British Petroleum Company, Ltd. The new name of the company conforms with its overall operations and changed position in the Iranian oil industry. The company's main trademark remains BP, as first adopted in 1921 and of recent years incorporated in the titles of most of its subsidiary and associated marketing companies.

## Road Tankers for Persia

Following the signing of the Consortium agreement, the National Iranian Oil Co. is taking delivery of a fleet of 60 Leyland Super Hippo large-capacity oil tankers for long distance transportation. Instead of having a normal 55 gallon tank, the engine in these vehicles is fed from a 110 gallon service tank incorporated in the main load-carrying tank which will give them a cruising range of 1,000 miles.

Twenty-six Super Hippos and 18 Comet cruiser-weight trucks have also been ordered from Leyland by the same company.

## Epikote Resins

Shell Chemicals Ltd. announce that the production of epikote resins, which began in the U.S.A. in 1949 and in Holland in 1953, will commence in the United Kingdom in the Shell chemical plant, Stanlow, Cheshire, by mid-1955.

These resins are produced synthetically from two chemicals, epichlorhydrin and diphenylolpropane, which chemicals have a petroleum base.

They are produced in various forms, from viscous liquids M.P. 8-12°C to solids M.P. 145-155°C, and are highly resistant to alcohol, grease, chemicals, etc.

## Shell to Make Endrin in Holland

At present, production of endrin is confined to the U.S.A., where it has been used to control pests attacking cotton, tobacco and sugar beets. It has also been widely used for pest control in other countries, an order for £20,000 having been placed by the Iraqui Government, where it will be used to control the spiny bollworm, which two years ago threatened to destroy up to 70 percent of the cotton crop.

In order to meet increasing demands, Shell has made plans to manufacture endrin by adding new facilities to the chemical insecticides plant at Pernis refinery near Rotterdam, where the production of aldrin and dieldrin is commencing. The new plant for the production of eldrin is expected to come into commission by mid-1956.

## New Oil Berths at Singapore

Four new oil tanker berths, three of which embody unique construction methods, are being built at Pulo Bukom, Singapore, at a cost of £500,000. They will be able to accommodate super tankers of up to 60,000 tons displacement, and new shore facilities will allow loading and discharge rates of from 1,000 to 1,500 tons/hour. Modern hose handling gear also being installed will result in considerable labor saving and reduction of hose wear.

The wharves were designed for Shell by Messrs. Sir William Halcrow & Partners, consulting engineers of London, who were also responsible for the supervision of actual construction. The latter was carried out by Messrs. Gammon (Malaya) Ltd.

Shell's marine installation at Pulo Bukom has 800,000 tons of storage capacity and berthing facilities for eight tankers.

The object in constructing the four new berths was, essentially, to provide a structure capable of absorbing the kinetic energy of vessels of up to 60,000 tons displacement when berthing at speeds which, it was estimated for the prevailing conditions, might be of the order of 9 to 12 inches per second. This was allied to the necessity of siting the structures in deep water. The problem was further complicated by the physical difficulties occasioned by a steeply shelving sea bed.

## Formation of New Research Company

A new company, "Shell" Research Ltd., is being incorporated to take over the research assets and activities in Britain of the Royal Dutch/Shell group of oil companies, work handled by the Shell Petroleum Co. Ltd. The new company will assume control of Thornton Research Center in Chester and Woodstock Agricultural Research Center in Kent.

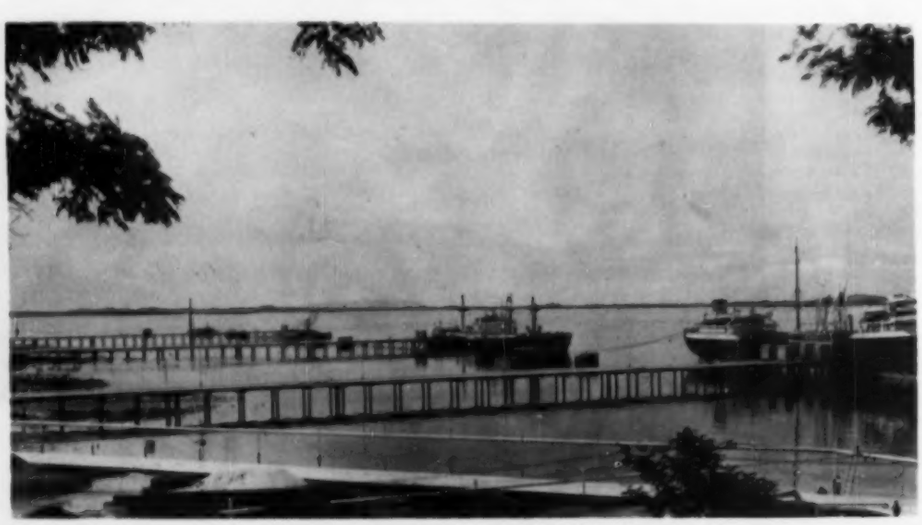
The work of "Shell" Research Ltd. will be coordinated with other research activities carried out by the Royal Dutch/Shell group in the Netherlands and in the United States. H. Bloemgarten will be chairman of the board of the new company and Dr. C. G. Williams will be a director and general manager. Research was carried out by Shell well before the war in both Holland and America, but it had its real beginnings in the United Kingdom in 1940 when an aero engine laboratory was constructed at Thornton.

From 1944 onwards, further laboratory facilities were added and at the present time research on a wide range of fuel and lubricating oil products, on bitumen, and on chemicals derived from petroleum, is being carried out at Thornton. The staff numbers about 850 and Thornton is probably the biggest and best equipped laboratory in the world for studying applicational problems of oil products, not only for the United Kingdom, but also for marketing areas abroad.

## Middle East Crude Oil Production

The following Middle East crude oil production figures for the month of November 1954 are announced:

| | LONG TONS NOVEMBER 1954 | JAN.–NOV. 1954 LONG TONS |
|---|---|---|
| Iraq Petroleum Co. Ltd. (Kirkuk field) | 1,935,631 | 21,673,433 |
| Basrah Petroleum Co. Ltd. (Zubair field) | 352,147 | 4,148,743 |
| Mosul Petroleum Co. Ltd. (Ain Zalah & Butmah fields) ... | 104,933 | 1,175,842 |
| Qatar Petroleum Co. Ltd. (Dukhan field) | 424,219 | 4,274,882 |
| Kuwait Petroleum Co. Ltd. ..... | 4,173,223 | 42,716,842 |
| Aramco ..... | 3,579,755) | 42,880,407) |
| (U.S. Barrels) | 26,490,189) | 317,315,016) |



*View of three new oil tanker berths at Shell's Pulo Bukom, Singapore, marine installation. They will accommodate super tankers of up to 60,000 tons displacement.*

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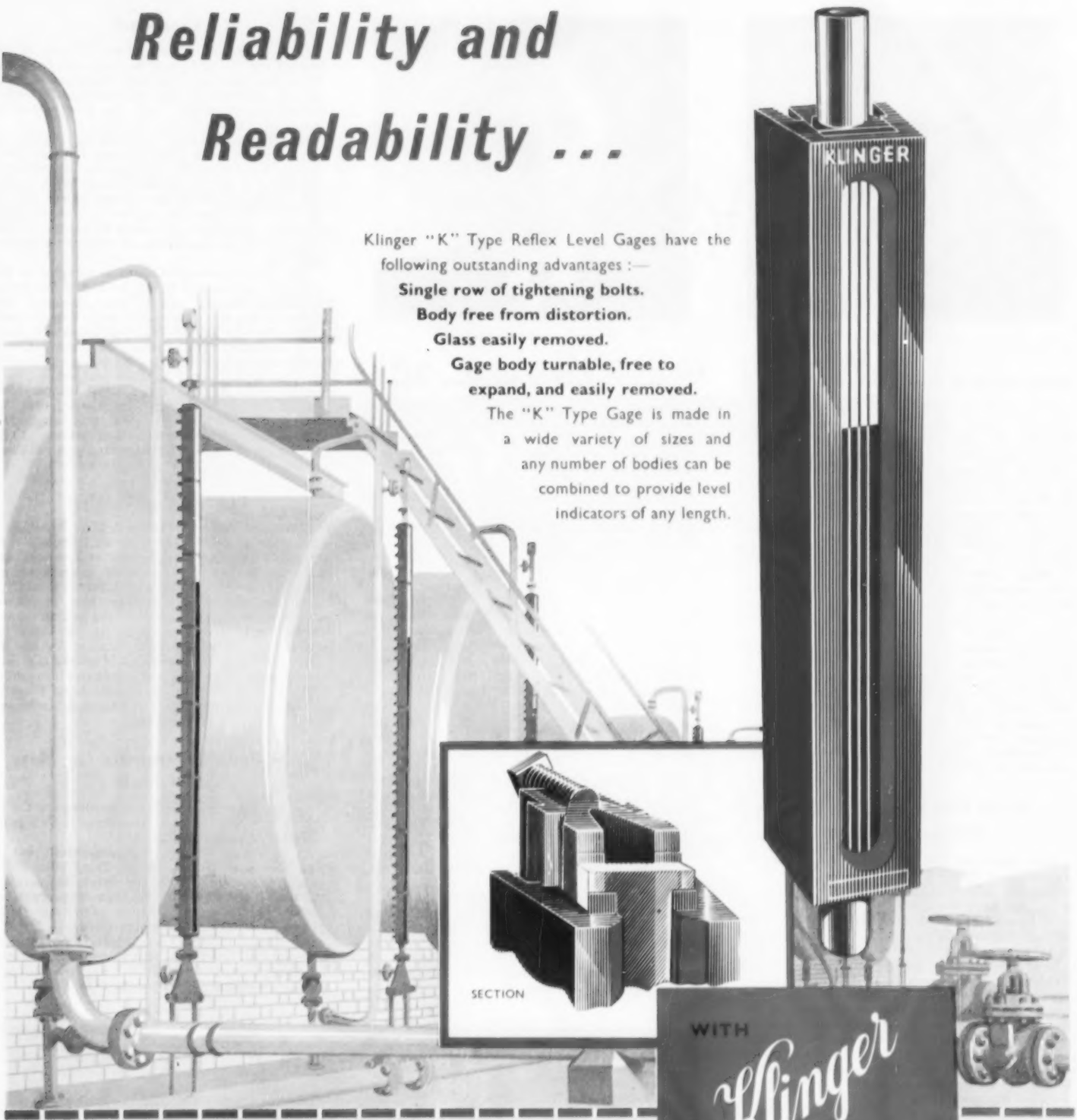


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## Retirement of Shell Refinery Manager

H. E. F. Pracy, manager of the Heysham Oil refinery, Lancs., since 1948, retired November 30 after 27 years' service with Shell. Before joining Shell, Mr. Pracy served three war years with the Ministry of Munitions and seven years in the chemical industry. During his oil career he filled a number of executive positions, first overseas and later at home. After spells of duty in British Borneo and Trinidad, he became manager of Shell Haven refinery, Essex (1942-44), and general manager of Stanlow Refinery, Cheshire (1944-48).

On his retirement, Mr. Pracy also relinquishes the appointment of general manager of Trimpell Ltd. The site at Heysham is occupied both by an oil refinery operated by Shell and by a chemical works operated by I.C.I. Trimpell Ltd. is a service company, operated by and on behalf of its two parent companies.

Mr. Pracy's successor as manager of Heysham Oil refinery is M. Willcocks, formerly assistant manager of Shell Haven refinery, and as general manager, Trimpell Ltd., E. Beesley, who comes to Heysham from I.C.I., Billingham division, technical department.

## Royal Dutch to Pay Higher Interim Dividend

The board of directors and the managing directors of N-V. Koninklijke Nederlandsche Petroleum Maatschappij (Royal Dutch Petroleum Co.) have decided to pay an interim dividend in respect of the financial year 1954 of six percent in cash, instead of an interim dividend of four percent as paid in previous years.

In connection with this increase of the interim dividend, reference is made to the general meeting of shareholders held June 16, 1954 in which a statement was made that an increase of the interim dividend would be considered in order to establish a better ratio between the interim dividend and the final dividend. As was stated at the meeting, no conclusion should be drawn from such an increase as to the total dividend covering the year 1954.

## Heat Exchange Equipment

Birwelco Ltd., Chester Street, Aston, Birmingham, through its subsidiary company Brown Fintube (Gt. Britain) Ltd., are now manufacturing heat exchangers under American patent licenses at Birmingham, incorporating longitudinally finned tubes which provide the most efficient utilization of heat.

In addition to the multiple-tube heat exchanger, they are also manufacturing a hairpin bend double tube exchanger on the same principle which permits easy connection of the number of sections required into a compact bank capable of performing almost any heat transfer duty. Another of their specialties is a storage tank suction heater, by which it is possible to pump out viscous oil from a storage tank in required quantities without heating the whole contents of the tank.

## New Oilfield in Southern Iraq

Production at Roumaila, the new oil field in southern Iraq, began in December. The field is situated about 20 miles west of the Zubair field of the Basrah Petroleum Co. which has been in production over three years. Oil was struck at Roumaila at the end of 1953 at a depth of over 10,000 feet in a geological formation similar to that at Zubair. A total of five wells has now been drilled to the production stage and three more are in process of drilling.

A de-gasing station has been built and was put into commission November 21, five weeks ahead of schedule. The pumping station feeds a 12-inch diameter surface pipe line which links the field with the Zubair field, from which the oil is pumped through 12-inch and 24-inch pipe systems to Fao, the sea terminal.

The extent of the new field is not yet known, but it is being actively developed in order to supplement the production from Zubair, in which field pressure has been more rapid than expected.

## Test Drilling on Mafia Island

The drilling of the first test well on Mafia Island off the coast of Tanganyika began December 17 under the auspices of H. E. the Governor of Tanganyika, Sir Edward Twining.

This search for oil in East Africa is a joint enterprise of the British Petroleum Co. Ltd. and the Royal Dutch Shell group, and drilling follows intensive geological and geophysical surveys, since 1951, over wide areas of East Africa.

The Mafia well, which may be drilled to a depth of 12,000 feet, is designed both to gain more knowledge of the stratigraphy of the area and to test for oil. Even if oil is not found, an important contribution to geological knowledge of the area will be obtained.

## Personnel

G. E. G. Hope-Johnstone, sales director of the Regent Oil Co. Ltd., will be resigning from the board of directors at the end of this year to take up the position of vice president of Trinidad Leaseholds (Canada) Ltd. He is expected to leave for Canada early this year.

Mr. Hope-Johnstone had held the position of sales director with Regent since January 1951. He has been some 35 years in the oil industry, including a period in the British West Indies and the Middle East, and during World War II served in the Fleet Air Arm as Lieutenant Commander. For nearly 25 years he has been connected with the marketing of Regent petroleum products.

He will be succeeded as sales director of the company, and on the board, by J. A. J. Nicholas, at present Regent's general sales manager. Mr. Nicholas has been associated with Regent since 1933, when he joined Trinidad Leaseholds Ltd. as a representative. From 1934 until the outbreak of war he was divisional manager, Cardiff. He joined the Army in 1939 and served as a major in the Royal Artillery until 1945, returning as division manager, Cardiff, until 1948. In January 1949 Mr. Nicholas was appointed branch manager of the Midland branch of the Regent Oil Co. He was appointed general sales manager of the company in January 1951.

## Platforming Catalyst

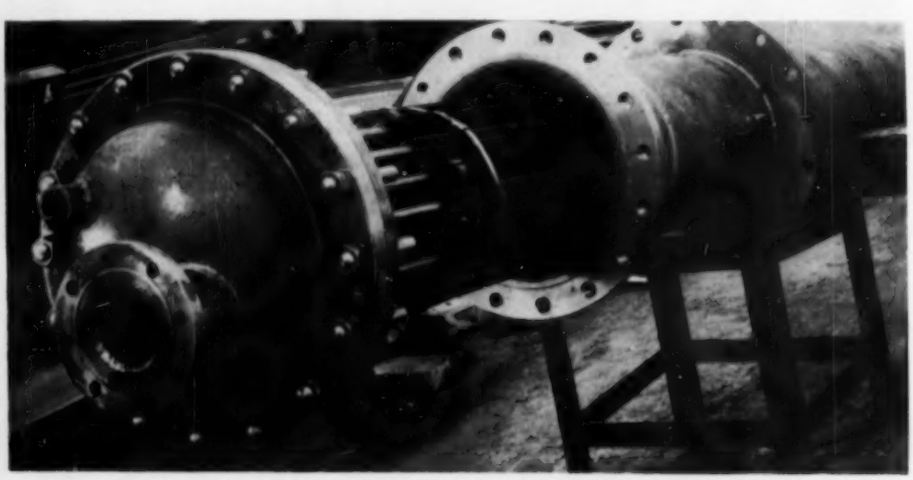
Universal-Matthey Products Ltd., which is a subsidiary of U.O.P., Des Plaines, Illinois and of Johnson, Matthey & Co. Ltd. of London, announces that a new catalyst manufacturing plant for the production of Platforming catalyst began operations in November 1954. The plant was built by Procon (Gt. Britain) Ltd. to manufacture and make available in the sterling market U.O.P. Platforming catalyst for use by refineries using this process. It marks the first time this catalyst has been manufactured outside the U.S.A. Contracts have been entered into to supply refineries in England, Germany, France, Australia and Aden.

## New British Petroleum Co. Move in Canada

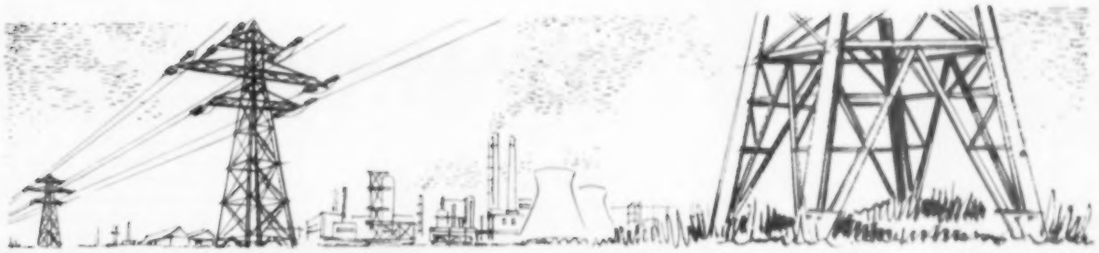
British Petroleum's D'Arcy Exploration Co. is to increase its holding to 50 percent in Triad Oil Co. Ltd. of Calgary, Canada.

In October 1943, D'Arcy announced that it was acquiring an interest in Triad equivalent to about 23 percent with an option to increase this holding up to not less than 50 percent by subscribing additional finance at a later date. This option has now been exercised.

In announcing this transaction, E. H. Tanner, president of Triad, said that it would ultimately increase D'Arcy's investment in Triad to approximately $19,500,000 (about £7,000,000).



*Partially assembled tank suction heater, now being manufactured in England by Brown Fintube (Gt. Britain) Ltd., subsidiary of Birwelco Ltd., Birmingham.*



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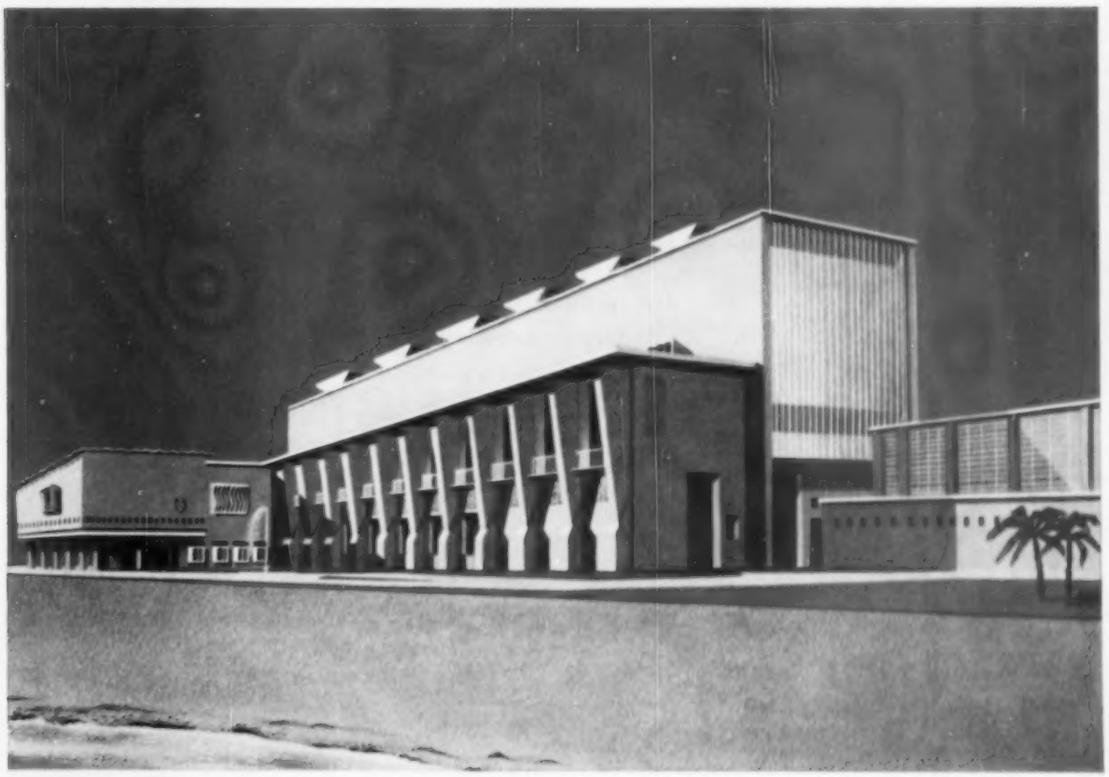

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# INTERNATIONAL NEWS AND NOTES

## Expand French Refinery

Major expansion has started on the Raffineries de Petrole de la Gironde refinery, an affiliated company of the Caltex Group, at Bec d'Ambes, France. Approximately $8,300,000 will be spent on a catalytic cracking unit, vacuum distillation unit, catalytic polymerization unit and general expansion of utility services.

The present refinery, at the junction of the Garonne and Dordogne Rivers fifteen miles north of Bordeaux, was completed in 1950 on the site of a war-damaged refinery. The average daily run during 1954 was 20,000 barrels. Refined products are distributed from thirteen bulk depots.

In line with the expansion of the refinery, the *Caltex Bayonne*, a 16,450-ton tanker, has recently been transferred to the French flag for operation under Outremer de Navigation Petroliere S.A.F.

In exploration, a new company is being registered to be known as American Overseas Petroleum (France) S.A. or "Amofrance." The joint stock company in which the principal owner is California Texas Corp. will have a capital of 100,000,000 francs.

Detailed geological work employing several French and American geologists is continuing in metropolitan France under the Caltex Group agreement with SNPLM (Soc. Nationale des Petroles du Languedoc Mediterraneen) covering joint exploration and producing.

## Gas Supply in Soviet Union

The head of the Natural Gas Section of the Soviet Ministry of the Oil Industry, upon the seventh anniversary of the Saratov-Moscow natural gas pipe line, stated that the Saratov fields in the Second Baku area are the richest in the Soviet Union. Construction costs of the gas pipe line to Moscow were allegedly paid off within two years of the start of operations.

Also supplied by the Saratov pipe line are Kasan, Stalingrad, and Kaluga. Rostov is to be connected early next year.

The Daszava field in the Polish Ukraine is Russia's second biggest producer. A prewar pipe line ran from Daszava to Lemberg, Poland, and at war's end a new 300-mile line was run to Kiev, which line supplies other towns along the route to Kiev as well.

Kuibitshev, supplied from gas fields at Sultangolova Bugurusian by a 90-mile pipe line, uses no other fuel than gas, nor does Briansk. Grosny, Makhack-Kala, and Andishan likewise have only gas for fuel.

The chief of the natural gas section also spoke of new gas-producing regions along the Volga, in Trans-Carpathia, Dagestan and the northern Caucasus Mountains.

His statement emphasized the importance of gas for automobiles. LPGas stations for trucks are operating in Kiev, Saratov and Lemberg.

The current Five-Year Plan (1951-55) aims at a gas production this year of 6.3 billion cubic meters, a reduction from the previous plan, which had called for 8.4 billion cubic meters, but was not achieved.

## Winter Kerosine Rationing

Kerosine rationing, suspended on March 31, began again October in Romania. Back rations for April, May, and June could be had in October, and for July, August, and September in November. Rations for the final three months of the year were procurable in December. According to the type of ration card issued, consumers got from 14 to 25 liters a month (3.70 to 6.60 U.S. gallons).

## Apex (Trinidad) Oilfields Dividend

At a meeting of the board of Apex (Trinidad) Oilfields Ltd. it was resolved to recommend a final dividend of 1s. 3d. free of income tax per 5s unit of stock, making a total dividend for the year of 1s. 6d. free of income tax per unit of stock on the increased capital of £1,100,000 (1952/53 2s. 6d. on £550,000).

The profit for the year to September 30, 1954, is £631,446 (£584,206) after providing £785,000 (£810,000) for taxation and £175,000 (£175,000) for development and contingencies. £300,000 (£300,000) is transferred to general reserve and unappropriated profit carried forward will amount to £244,950 (£243,504).

## Romanian Gas Production

Production of natural gas for household and chemical plant use has increased over seven times since 1944, according to *Agerpres*. This year's output is expected to surpass 1953 by 20 percent. The length of Romania's pipe lines has increased by four times since 1944.

## Gulf Oil to Establish Divisional Office in London

Gulf Oil Corp. has opened a production department divisional office in London, England, headed by C. W. Hamilton, Gulf vice president, who will be responsible for all of the company's production and exploration activities in the Eastern Hemisphere.

Gulf is making this move in order to have closer executive relationship with its activities in Europe and the Middle East. These include such important interests as joint ownership in the Kuwait Oil concession and participation in the Iranian Consortium. A wholly-owned subsidiary is now starting production on a concession at Ragusa, Sicily. Gulf also is currently conducting exploration in other countries in the Eastern Hemisphere.

Mr. Hamilton transferred to London early in January with members of his staff chosen from Gulf personnel in the United States.

Mr. Hamilton, who has been with Gulf for 39 years, started as chief geologist of the Mexican Gulf Oil Co. in 1916 and a short time later was made general agent for Mexican Gulf. He was elected a vice president of the corporation in charge of foreign production in 1940. Altogether Mr. Hamilton has had 52 years' experience with foreign oil affairs.

*C. W. Hamilton*

## To Complete Lebanese Refinery

Mediterranean Refining Co. (Medreco) has reached an agreement with the Lebanese government under which it will complete the new refinery at Sidon, 30 miles outside Beirut.

An expansion program also will be undertaken for completion in 1956, it was announced. This will increase the capacity of the crude oil unit and add a second Platformer, increasing the refinery capacity from 6,000 to 9,000 barrels of crude oil daily, and the total investment from $6 to $8 million. The refinery is expected to make Lebanon independent of overseas sources for finished petroleum fuels. The country now imports about one-third of its kerosine, 40 percent of its gasoline and 60 percent of its gas oil.

The refinery is one of the largest investments from any source in Lebanon's history and is the first major industry in southern Lebanon. It is owned jointly by California Texas Corp. and Socony-Vacuum Overseas Supply Co. The present plant consists of an atmospheric distillation unit and a catalytic reformer, together with allied processing facilities. Almost all the employees will be Lebanese nationals.

## Nahorkatiya Stepout Is Failure

The latest deep well, Nahorkatiya No. 5, to be drilled in the recently discovered oil area southwest of the main Digboi oilfield in Assam, India, is a failure, the Assam Oil Company Ltd. has announced. Drilled to a depth of 10,945 feet, the well penetrated all the sandstone rock layers productive in earlier wells in the area, but failed to yield any sign of oil.

The extent of the oil bearing area to the south of the original No. 1 discovery well is, therefore, much less than was expected. Well No. 5 is the first failure at Nahorkatiya. Well No. 6, to the northwest of Wells 1 and 2, started drilling in December.

## Start Test in Sicily

Drilling of its first test oil well in Sicily by the Mediterranean Oil Co. was started late in December on a 29,603-acre concession, three miles northwest of the Ragusa field, where American International first found oil in commercial quantities in January 1954. Shipment of crude from the Ragusa field to the RASIOM refinery at Augusta, Sicily, was started on December 16.

Mediterranean Oil Co. is jointly owned 65 percent by Gulf's wholly-owned subsidiary, American International Fuel & Petroleum Co., and 35 percent by MacMillan Petroleum Corp.

## Bolivian Oil Workers Meet

On October 12 the Third Congreso Nacional de Trabajadores (Association of Bolivian Oil Workers) met in Daijaro. Delegates from all branches of the industry—producers, pipe line operators, refiners and distributors were represented. The two chiefs of YPFB were unable to attend, but sent a message congratulating the Bolivian oil men for their part in the recent upsurge of the national oil industry.

## Yugoslav Production Increasing

Naphthaplin, the Yugoslavian state oil enterprise, reports June crude production at 4,200 barrels daily from Yugoslavia's four fields: Velika Gorica, Mramor Brdo, Ivanicgrad, and Bunjane. Drilling of new wells is progressing, more than 26,000 meters having been drilled during the first half of 1954. Last year first half production by Naphthaplin was 3,000 b/d.

# International Paints *IN FRANCE*

The associated "International" factory at Le Havre is manufacturing paints for a variety of purposes. At Le Havre they have on-the-spot experience of paints for the French market plus the wealth of information accumulated by the "International" world-wide organisation.

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## Australian Refinery Construction

The Caltex Group's oil refinery at Botany Bay in Australia is 50 percent complete. Situated about 20 miles south of Sydney, at Kurnell, only a short distance from where Captain Cook first set foot in Australia in 1770, the refinery is scheduled for completion during 1955.

Designed to process 22,000 barrels a day of crude oil, the total capital investment is estimated at $27 million. The refinery will have a two-stage distillation unit, a propane decarbonization unit, a fluid catalytic cracking unit, polymerization unit and steam and electric generating plant. Preparation of the marine facilities was a major engineering job requiring dredging of millions of yards of sand in the bay. A long wharf and swinging basin will be able to accommodate the largest tankers afloat.

## May Revise Turkish Oil Law

The Government of Turkey, which recently adopted a new law opening up the country to petroleum exploration and development by private companies, is considering basic changes in the legislation, it is understood.

Elmer E. Batzell of Washington, D.C., attorney who helped draft the original petroleum law which was adopted during 1953, was asked to leave for Turkey in December 1954 to talk over possible changes with officials of the government.

The changes under discussion, it was explained by government authorities, would be designed to make petroleum activity in the country even more attractive to private oil companies.

## May Liberalize Oil Legislation

The government of Guatemala is considering legislation which would open up the country to exploration, it was learned. Elmer E. Batzell, attorney of Washington, D.C., who helped draft the new petroleum law for Turkey, was in Guatemala recently conferring with officials about the proposed new step.

A draft of possible legislation was supplied by a Commission of the Government of Guatemala and is being circulated at the present time among executives of American oil companies and others. Any final action, either towards whipping any law into final shape for submission to legislative bodies, and towards final legislative action, is some time off, it is understood.

## Underwater Seismic Survey

An underwater seismic survey has begun in the waters off the Persian Gulf territory of Abu Dhabi, where Commandant Cousteau and his team of divers assisted in a geological survey last year. The British Petroleum Co. (formerly Anglo-Iranian Oil Co.) and the Compagnie Francaise des Petroles are partners in the operating company Abu Dhabi Marine Areas Ltd. The survey is expected to last about four months. It is being conducted from the 405-ton vessel, "Sonic", a specially converted landing craft belonging to Geomarine Service International.

## To Build Refinery in Hawaii

Standard Oil Co. of Calif. will build a large modern refinery at Honolulu, it was announced, following a meeting of company directors in that city. A suitable site now is being sought. The proposed plant will have a capacity of 20,000 to 30,000 b/d and will cost $25 to $30 million. California Standard built its first distributing plant in Hawaii 50 years ago although company products have been sold in the islands since the late 1800's.

## Yugoslavia Discovery

Prospecting between Zagreb and Kutina in Yugoslavia revealed oil strata at 1,200 to 1,700 meters. Kutina's production is expected to be increased from this year's 180,000 metric tons to a quota of 215,000 metric tons for 1955. Enough natural gas to supply all Zagreb is expected.

## Abqaiq Test Lab Nears Completion

Arabian American Oil Company's new $250,000 Abqaiq district oil operations laboratory has been virtually completed. The new lab will make possible a more efficient system of testing and analysis in oil operations by trimming Abqaiq's present six labs down to three.

The three new labs will also be able to handle work which presently has to be farmed out to the Dhahran district oil operations lab and the Ras Tanura refinery lab.

The big new lab, which covers 4,000 square feet, was turned over to the company September 7. Construction at the site between the stabilizer and the gas injection plant started April 15.

Some of the new duties planned for the lab include the geo-chemical analysis of water, the complete analysis of produced gas, the pilot testing of drilling mud and the checking of oil well cement.

In charge of the new lab is Oil Operations Engineer Fred Schoepflin, Jr. with District Operations Engineer Pete Collins in overall charge.

## Neutral Zone Discovery

American Independent Oil Co. has discovered a productive horizon hitherto unknown in the Middle East. Oil was found in porous limestone at 6,760 feet in an exploratory well being drilled for the joint account of American Independent and Pacific Western Oil Corp. in the Kuwait-Saudi Arabia Neutral Zone. On a drill stem test the well flowed 25.6 gravity oil at an indicated rate of 2,400 barrels daily.

The discovery was on the so-called Wafra structure in the west-central part of the Neutral Zone, where Aminoil and Pacific Western have 15 wells producing from the shallower Burgan horizon at a depth of about 3,500 feet. The new strike, at a depth of 6,760 feet, opens up a productive limestone section that has not previously been known in the Persian Gulf area.

## LPGas Pipe Line in Romania

A pipe line is to be constructed for the delivery of part of the LPGas produced by Ploesti refinery No. 1 to Bucharest. A filling station for liquid gas containers will be built in Bucharest.

This pipe line will assure Bucharest consumers of steady supply—160,000 are currently using liquid gas for cooking. Two emergency pipe lines, for special fuel and for refined kerosine, will follow the same route, as a safety measure for supply during severe weather. These pipe lines will enable the many trucks now carrying liquid gas containers between Ploesti and Bucharest to do other work.

## Beaird Ships Pressure Tanks to Mexico

An international rail shipment of pressure tanks so gigantic that each must be carried on three flatcars has been rolling out of The J. B. Beaird Co., Inc., Shreveport, La. destined for the new Reynosa gasoline plant of Petroleos Mexicanos. Valued at $367,581, the total shipment of 41 tanks is the largest mass shipment from Shreveport since bulk war material movement during World War II.

Included in the order are 25 of the largest pressure storage vessels in the industry—new Beaird 70,000-gallon pressure vessels for storing liquefied gas and oil products.

## YPFB Chairman in Oil Talks in Brazil

The chairman of Bolivia's YPFB recently went to Rio de Janeiro to begin talks with Brazilian oil officials with a view to importation of Bolivian gasoline and kerosine for consumption in the Brazilian district of Corumba. He was to go on to Buenos Aires to complete arrangements for delivery of 1,250 b/d of Bolivian oil in accordance with a contract previously signed in La Paz, and from there to Asuncion to arrange for delivery of Bolivian gasoline, kerosine and diesel oil on the Paraguayan market.

## 64-Year-Old Well Still Producing in Peru

One of the world's oldest active oil wells, a producer for more than 64 years, pumped up its 80,000th barrel of crude oil last month. This modest producing milestone was reached by well number 8, located on the old zone of LaBrea and Parinas, which is operated by International Petroleum Co. Ltd. in Peru.

Well number 8, which was drilled to the relatively shallow depth of 545 feet in just 11 days, started producing on November 13, 1889, and has produced continuously ever since. It began producing only two years after the first oil well was drilled in Texas and eight years before Oklahoma, then still classed as Indian Territory, brought in its first oil well. Always a comparatively small producer, the Peruvian well now yields approximately 30 barrels of oil per month.

## Brazilian Drilling Contract

Drilling and Exploration Co., Inc. (Nevada) has signed a two-year contract with Petroleo Brasileiro S.A. (Petrobras) to supervise drilling and production activities of the Brazilian company. Drilexco has similarly contracted for technical supervision of Conselho Nacional do Petroleo operations during the past 15 years. The U. S. company has been concerned with most phases of Brazilian oil activity since the initial discovery well was drilled in the State of Bahia in 1939.

The new contract was signed by J. E. Brantly, Jr., vice president of Drilexco, and Colonel Arthur Levy, president of Petrobras. Mr. Brantly is in charge of Brazilian operations from offices in Brazil. R. L. Rose, Los Angeles, is president.

## Scholven Dehydrogenation Plant In Operation

As a part of the project of extending its fuel production plants, Scholven-Chemie AG., Gelsenkirchen-Buer, has recently put on stream its new heavy gasoline reforming unit. Parts of the dehydration plant erected during the war have been included in this unit. The applied process is similar to the catalytic reforming method developed in USA.

After having put its polymerization gasoline plant into operation in June 1954, Scholven-Chemie AG. has now provided the prerequisites for a further improvement of gasoline quality.

## Oil Prospecting by Shell D'Arcy

A show of oil has been encountered by the Shell D'Arcy Petroleum Development Co. of Nigeria at its deep test well at Itak Inbang in the Calabar province of the eastern region of Nigeria. It is still too early to say whether or not there is oil in commercial quantities, but the preliminary results are encouraging. Further testing is being carried out.

This is the second time that an oil show has been encountered in Nigeria. In November 1953, a well at Akata, also in the Calabar province, proved the existence of oil deposits, but other test wells must be drilled before the oil potentialities of the area can be fully appraised. A second test well has begun drilling at Akata.

## GATX Licenses Process Rights

General American Transportation Corp., has signed a contract with the Societe Europeenne de Revetement Chimique (S.A.) licensing that company exclusively to use and to sub-license General American's Kanigen plating process in several countries and territories abroad. The society, a new company to be known as SEUREC, is composed of ten well-established French industrial firms.

## Sisak Refinery Nears Completion

The new refinery at Sisak, Yugoslavia is being outfitted by the M. W. Kellogg Co. and the German F. Uhde Co. Its capacity will be 10,000 barrels per day and it will start production early next year.

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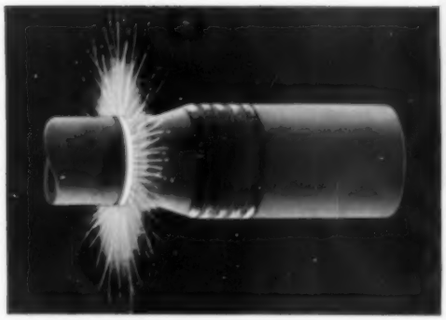

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# OIL COMPANY STAFF CHANGES

**HENRY L. PHILLIPS,** chairman of Sinclair Oil & Gas Co., producing subsidiary of Sinclair Oil Corp., and vice-president of the parent company, retired from active executive duties on December 31, 1954. He will, however, continue to serve as a director of both Sinclair Oil Corp. and of the producing subsidiary.

In his 38 years of service with Sinclair, Mr. Phillips has held many executive posts. He joined Sinclair's legal department in 1916, two months after H. F. Sinclair founded the company.

After service in World War I, Mr. Phillips was made president of Sinclair Crude Oil Purchasing Co. in 1921. Elected president of Sinclair Oil & Gas Co. in 1930, Mr. Phillips directed the company's exploration and producing operations. In 1940 he also became chairman of Venezuelan Petroleum Co., active in exploration and production in Venezuela. Mr. Phillips also headed all Sinclair pipe line operations, and in that capacity planned and supervised the building of the organization's first products pipe line from the refinery at Marcus Hook, Pa., to Baltimore, Maryland, Washington, D.C., and later on through to Chicago.

Under his supervision, the company built almost all of its present 3,052 miles of products lines. He also was one of the founders and the first president of the Platte Pipe Line Co., in which Sinclair has a part interest, and which built and operates a 1,149-mile, 20-inch line to carry crude oil from the Wyoming oil fields to the St. Louis, Mo., refining area.

*H. L. Phillips*

**WILLIAM B. HEROY** has been elected a director of the Diamond Oil Well Drilling Co., Midland, Texas. Mr. Heroy was formerly chief geologist with the Sinclair Oil Corp. Since that time, he has had extensive experience in the Federal Petroleum Administration serving as both Chairman of Resources and Director of Foreign Production, and special assistant to the Secretary of the Interior. He is now president of The Geotechnical Corp. and partner in the geophysical and engineering firm of Beers and Heroy.

*W. B. Heroy*

**ARCHIE D. GRAY** has been elected associate general counsel of Gulf Oil Corp. and Russell G. Connolly has been elected secretary. Mr. Gray has been associate general attorney for Gulf and various of its subsidiary companies since 1947. Mr. Connolly has been a member of the company's law department since 1948.

**PEVERIL O. SETTLE,** secretary and associate general counsel of Gulf Oil Corp. and its subsidiary companies, retired December 31. He joined the company in 1926 at Houston.

**GEORGE H. FREYERMUTH** has been elected executive vice president and a director of Esso Export Corp. For the past ten years he has been director of public relations for Standard Oil Co. (N.J.), an activity in which he has traveled widely to consult with foreign affiliates.

Mr. Freyermuth joined Esso Standard as a chemical engineer at the Baton Rouge refinery in 1928. After a period in research he moved to the sales department to head the section handling development and application of fuels and lubricants. He was assistant manager of sales engineering in 1943 when he was transferred to the public relations department of the parent company.

*G. H. Freyermuth*

**JOHN J. WAYBRIGHT,** refinery engineer and executive, becomes assistant refining coordinator in connection with North American refining activities for Standard Oil Co. (N.J.) in a series of appointments announced by the company. Mr. Waybright has served the past two years as refinery manager for Esso Standard Oil Co. at Everett, Mass.

Also announced is the appointment of Paul J. Harrington as general technical advisor covering technical and associated economic problems in the coordination of Jersey refineries. This assignment will transfer him from Standard Oil Development Co., for which he has been assistant chief engineer since 1950. Mr. Harrington joined Esso in 1929.

Additional appointments in the refining coordination department include assignments of A. T. Rynalski and J. E. Woodward to area advisory posts. Effective December 15, Mr. Rynalski becomes area advisor covering refining activities of two Caribbean affiliates, Creole Petroleum Corp. and Lago Oil & Transport Co. Ltd. Mr. Woodward became area refining advisor for the United Kingdom, Eire and France on January 1. He succeeds M. J. Jamieson, who will retire February 1 after 35 years of service with Jersey Standard.

**CHARLES N. POLLAK** has been appointed manager of the public relations department of Tide Water Associated Oil Co., it is announced by D. T. Staples, president.

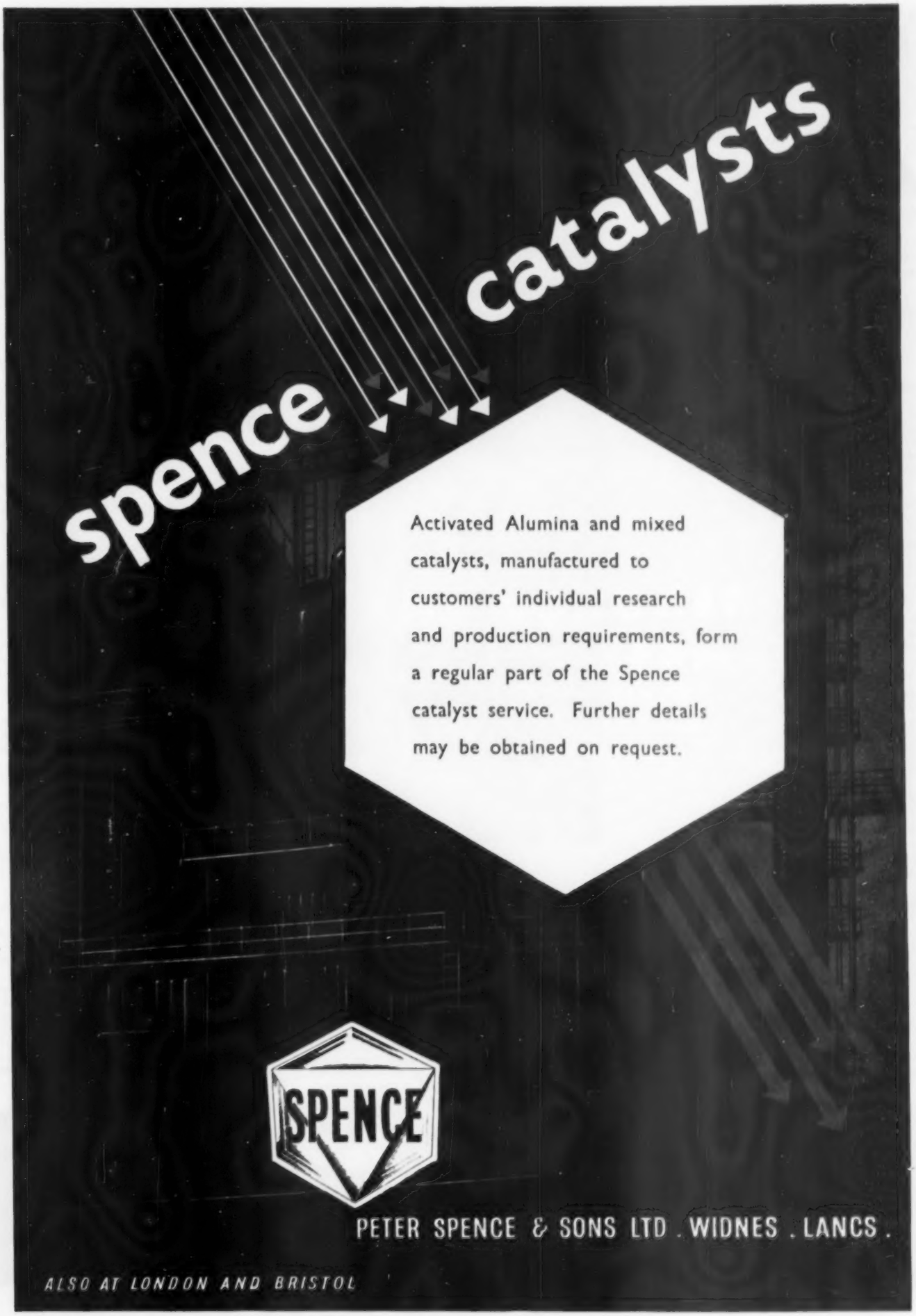
In this post, a new one, he will plan, develop and coordinate the company's national public relations activities. His headquarters will be in San Francisco.

Mr. Pollak, a graduate of Harvard, served as a United Press correspondent in Buenos Aires, Argentina and at the United Nations in New York. He spent two and a half years with Creole Petroleum Corporation's public relations department in Caracas and Maracaibo, Venezuela. More recently, he was managing editor *Petroleum World & Oil*, Los Angeles, and subsequently Pacific coast editor of *National Petroleum News* and *Oilgram News Service*. He also was a lecturer on Latin America at the University of Southern California.

**JOHN S. THOMPSON** has been appointed superintendent, coordination, of Sun Oil Company's Marcus Hook refinery. Other appointments include C. Calvin Naylor, superintendent, operations; A. Earle Creamer, superintendent, blending and packaging; W. Harlan Taylor, assistant superintendent, blending and packaging; and William A. Casey, assistant to Marcus Hook refinery manager W. T. Askew.

**JAMES T. ROTHENBERGER** has been appointed general maintenance superintendent at General Petroleum Corporation's Torrance, Calif., refinery, according to C. M. Reading, manager of the engineering department. Mr. Rothenberger joined the company as a roustabout in 1933. Prior to his promotion he was assistant maintenance superintendent, a post he had held since 1947.

**RONALD L. CLARK** has been appointed supervisor of market research and development of Brea Chemicals, Inc., Brea, Calif., subsidiary of the Union Oil Co. of Calif. He was formerly assistant director of market research for the Vick Chemical Co. and subsidiaries, New York.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**H. E. BRANDLI** has retired as president of Cities Service Oil Co. (Pa.), principal marketing subsidiary of the Cities Service system in 13 northeastern states and the District of Columbia. He will continue his activities with the organization on a consultant basis. Mr. Brandli joined the Cities Service organization 43 years ago, one year after it was founded. He is a veteran of 30 years with the Cities Service system. His early career was in the engineering and manufacturing phases of petroleum activities, and in 1937 he joined the marketing organization of Cities Service Oil Co. (Del.), with headquarters in Chicago. He became marketing vice president in 1950.

**CLYDE F. DOWD,** manager of Tide Water Associated Oil Company's eastern division traffic department, retired December 31 after 33 years of service with the company. He joined Tide Water Associated as traffic manager at the Tulsa, Okla., office in 1921. In 1934, he was named supervisor of traffic operations in the company's eastern division and, in 1941, was advanced to manager, his present post.

**HENRY J. COLEMAN** has been appointed sales manager of the petrochemical department of The Standard Oil Co. (Ohio). Mr. Coleman joined Sohio in 1946 as staff assistant in marketing research, became advertising manager for Sohio in 1949 and now is chief of site development in the marketing department.

**KENNETH C. WOODYARD,** Houston, has been promoted to the newly created position of division geophysicist for Continental Oil Co. with headquarters at Shreveport, La. He formerly was associated with Conoco's southern region headquarters geophysical section at Houston.

**C. E. LANE,** assistant treasurer in charge of the insurance department of Gulf Oil Corp., retired December 31. He was succeeded by J. A. Edwards.

**GEORGE L. BONAR,** assistant to the president of The Texas Co., has been named assistant to the chairman and Hanson D. Teeters, executive assistant in the finance and economics department, has been made assistant to the vice-president.

Mr. Bonar joined Texaco's refining department at Tulsa in 1928. He became assistant to the president in 1950.

Mr. Teeters began his service with Texaco in 1928 as credit manager in Los Angeles and later became general credit manager. He was appointed assistant treasurer in 1945 and executive assistant in 1952.

**ROBERT FISHER** has been elected financial vice president of The Texas Co. and Stanley T. Crossland vice president and treasurer, effective January 1, 1955.

Mr. Fisher, treasurer of the company since 1949, succeeds L. H. Lindeman, who retired December 1, 1954.

The company also announced the appointment of Robert G. Rankin, assistant comptroller, to the newly created position of director of the budget.

William R. Love, special auditor in the comptrollers department and assistant to Mr. Rankin, succeeded the latter as assistant comptroller.

*R. Fisher*

*S. T. Crossland*

*H. E. Linam*

**ALLEN HOWARD,** formerly auditing department manager for Shell Oil Co., has been appointed assistant controller. David I. Meriney, formerly assistant auditing department manager, succeeds Mr. Howard. Mr. Meriney has been succeeded by James E. Peck, formerly treasury manager for the firm's Midland, Texas, production area office.

*R. D. Sloan*

*G. E. Wagoner*

**R. D. SLOAN,** Denver, Colo., has been named division manager of Carter Oil Company's western division to suceed George E. Wagoner, who has been appointed exploration advisor of International Petroleum Co. Ltd. at Coral Gables, Florida. The changes were effective January 1, 1955.

Mr. Sloan started work for The Carter Oil Co. as geologist in Tulsa in 1934. He became western division exploration manager at Denver in 1948.

Mr. Wagoner began his oil industry career in 1930 as an employee in the Humble Oil and Refining Company's geological department. After four years with Humble, he transferred to Carter. He became manager of the company's western division at Denver in 1953.

**JOHN W. GENDRON** has been appointed manager of the oil purchase and exchange department of Tide Water Associated Oil Co., a newly created position. Mr. Gendron will be responsible for regulating the supply and coordinating the crude and products requirements of the manufacturing and marketing operations of the company.

**JACK A. RAMSDELL,** Calgary, Alberta, Canada, has been appointed geophysical supervisor for Continental Oil Co., with headquarters in Jackson, Miss.

**HENRY E. LINAM,** president of Standard Oil of Venezuela from 1932 to 1943, has assumed direction of joint operations of Trans-Cuba Oil Co. and Cuban-Venezuelan Oil Voting Trust with headquarters in Havana.

A $3,000,000 drilling and exploration program has been started on concession rights covering more than 14 million acres in Cuba's three big sedimentary basins. The first well, contracted to Jones Brothers Drilling Co. of Shreveport, La., was spudded in November 27 near the town of Jucaro on the southern coast of Camaguey Province.

Mr. Linam began work for Standard in Venezuela as a driller and within seven years was president of the company (now Creole) at the age of 32. During his presidency, Standard Oil of Venezuela's production rose from third to first place.

Following his resignation from Standard in 1943, he returned to the United States and as an independent oil operator continued his oil finding success.

Mr. Linam has been a trustee of the Cuban-Venezuelan Oil Voting Trust since its beginning in June 1950, contributing advice and financial support. CVOVT represents 24 companies with concession rights and was organized by Warren W. Smith, former president of Pantepec Oil Co. of Venezuela. CVOVT has pioneered Cuban oil exploration, making extensive geological and geophysical surveys.

This year, a group of prominent Cuban sugar men, bankers and industrialists, under the leadership of Dr. Viriato Gutierrez, Mr. Jose M. Bosch, Dr. Jose Ignacio de la Camara and Mr. Alejandro Suero, formed Trans-Cuba Oil Co. to jointly explore and drill the areas of the 24 companies.

Trans-Cuba and CVOVT recently made a 750,000 acre farmout to Cuban-American Oil Co., organized by Mr. Tevis Morrow of Los Angeles, and Mr. Grady Vaughn and Mr. Herbert Kline, of Dallas. Cuban American is currently carrying out a drilling program which will total 40,000 feet of exploratory wells.

Mr. Linam's faith in the oil possibilities of Cuba is such that he has assumed direction of Trans-Cuba and CVOVT's operations without salary.

**L. B. McCAMMON,** manager of the products distribution department of The Ohio Oil Co., retired December 1 after 24 years' service with Ohio Oil. M. D. King, assistant manager of the products distribution department, succeeds him as manager.

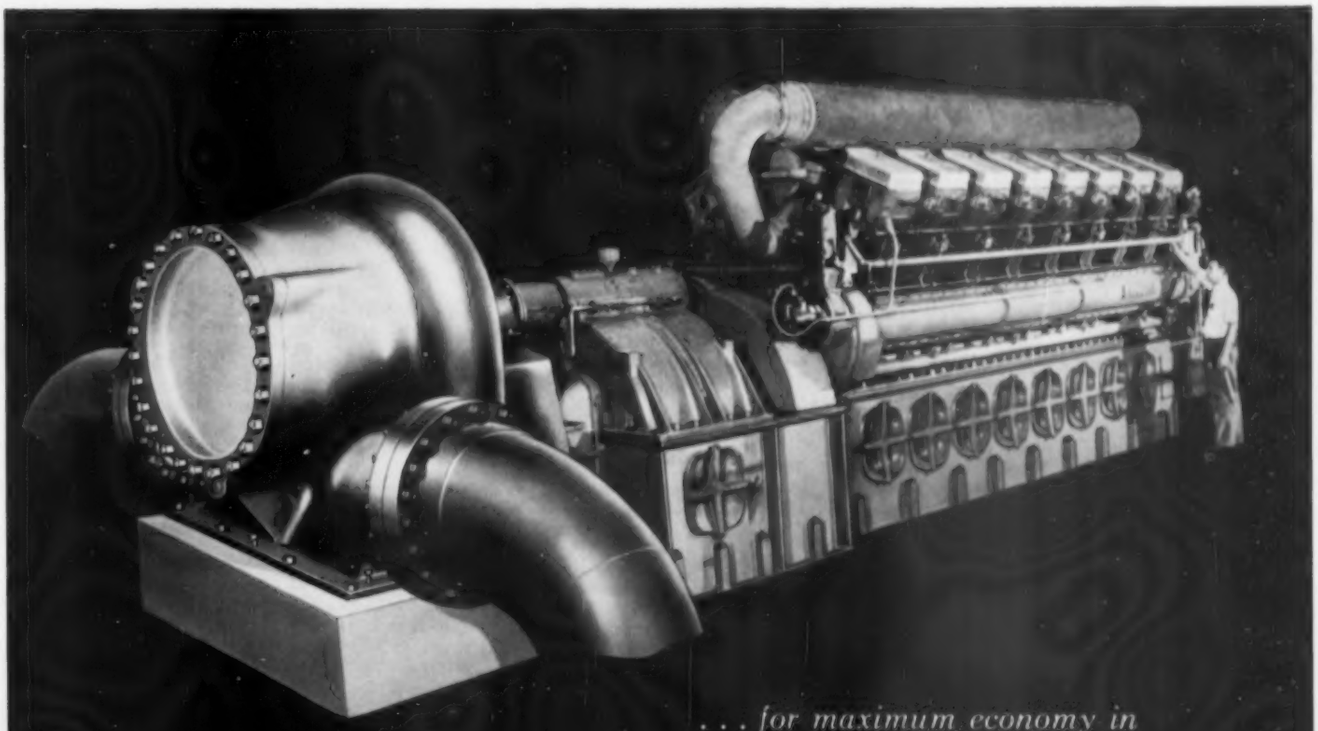
Mr. McCammon joined Ohio in 1930 when the company acquired the properties of the Transcontinental Oil Co. He was employed by Transcontinental from 1920 to 1930 and was a vice president and director of that company. He had been employed by the Benedum Trees Oil Co. from 1915 to 1920.

His first assignment with Ohio Oil was vice president of the former Marathon Oil Co. When the company sold its marketing facilities in the Mid-Continent in 1939, he was appointed manager of the the newly organized refined products supply department.

A native of Findlay, M. D. King first worked for Ohio Oil as messenger in the general office in 1926 between school terms at Findlay College. His continuous employment began in February 1931 as secretary in the refining and marketing department. He was appointed assistant manager of the products distribution department last January.

*L. B. McCammon*

*M. D. King*



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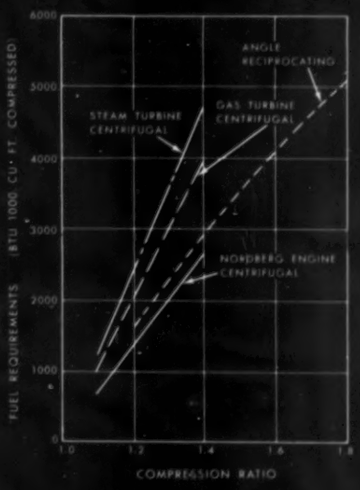


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### Multi-stage Quantity Control Valves

A new line of quantity control valves which eliminate the severe hydraulic shock accompanying rapid cut-off of large-volume flows has been introduced by Rockwell Manufacturing Co. These new valves are designed to be used in conjunction with a Rockwell developed multi-staged register latching device on Rotocycle meters. These meters have rated capacities of 20 gallons per minute minimum to 800 gallons per minute maximum for the 2 to 6 inch sizes inclusive.

Rapid closure with only relatively slight increases in pressure is one of the outstanding operating characteristics claimed for the valves. Closure time varies from 7½ seconds for the smaller, to 12½ seconds for the larger sizes. In each case, closure is accomplished in three stages, each lasting a few seconds.

### Houdriformer Construction Begun

Construction started October 15 on a Houdriformer unit at the No. 2 plant of the Catlettsburg refinery of the Ashland Oil & Refining Co. This new unit will have 8,500 barrels daily pretreating capacity and 6,000 barrels daily reforming capacity, and is being engineered and built by Catalytic Construction Co. of Philadelphia. Plans call for completion in mid-1955.

### Multi-range Integrator

A new model Rockwell integrator, a device that mechanically computes the metered volume of gases, steam or liquids from orifice meter charts, and offers greater capacity, simplified change-over, speedier operation and increased resistance to wear, has been introduced by the Rockwell Manufacturing Co., Pittsburgh. The integrator is electrically operated.


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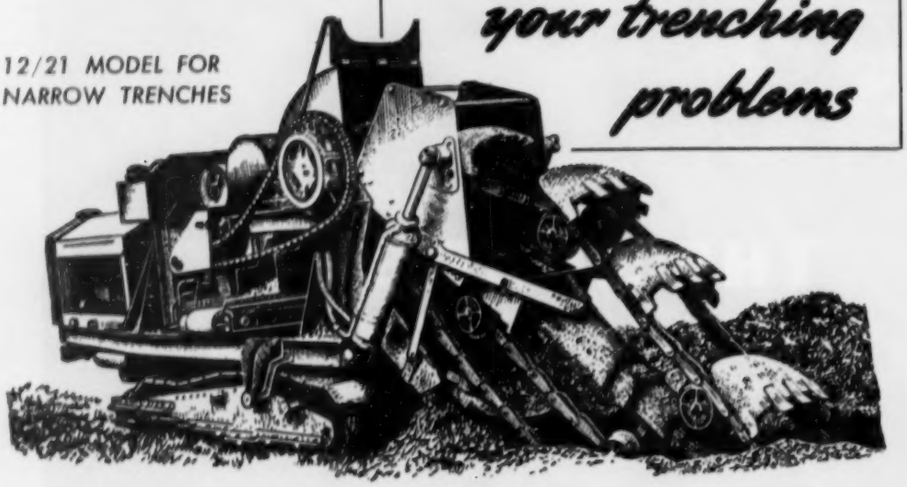

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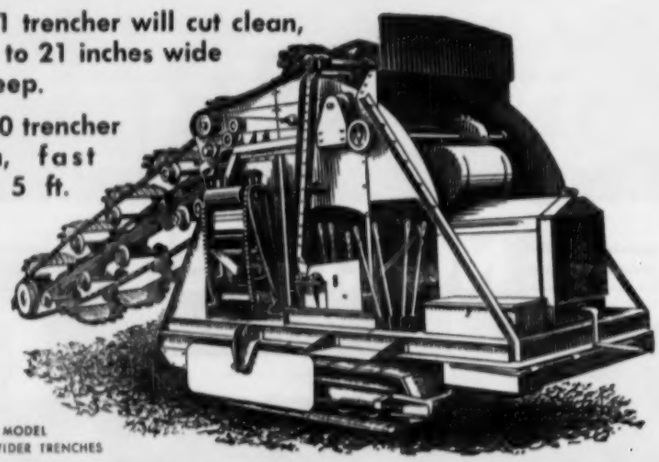

*Illustrated catalogues sent on request.*

16/60 MODEL FOR WIDER TRENCHES

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### William M. Burton

Dr. William M. Burton, 89, retired president of Standard Oil Company (Ind.) and noted Chicago industrial pioneer, died December 29 at Miami, Fla.

With his associates he developed the first commercially successful cracking process. Patented January 7, 1931, following development in the laboratory at Standard's Whiting, Ind. refinery, the Burton process more than doubled the potential yield of gasoline available from crude oil to meet the stupendous demand for gasoline which the automobile was to create.

Dr. Burton joined Standard of Indiana as its first chemist at the Whiting refinery in 1890. He became general superintendent in 1895, a member of the board of directors in 1911, and served as vice president from 1915 until 1918, when he became president. He resigned the presidency in 1927.

Dr. Burton received the Willard Gibbs medal of the American Chemical Society in 1918 and the Perkin medal of the Society of Chemical industry in 1922. In 1946 he was honored as a "pioneer in oil cracking" by the American branch of the Newcomen Society of England. He was awarded the American Petroleum Institute Gold Medal for Distinguished Achievement in 1947.

With Dr. Robert E. Humphreys, who had come to Whiting from Johns Hopkins in 1900 and Dr. F. M. Rogers who joined the staff in 1908, Dr. Burton started the first work ever done in an industrial laboratory toward producing petroleum products by chemical change rather than by ordinary physical separation. Difficulties in perfecting the process were complicated by the lack of metal alloys necessary for operation at 95 psi and 750°F.

By January 1913, the first 12 Burton stills were in successful operation, their capacity being 8,250 gallons each. And by 1922 their number had increased to 893. During the first 15 years the Burton stills were in use they saved over one billion barrels of crude which would have been required to make the same amount of gasoline under the old skimming methods.

### Frank M. Siebert

Frank M. Siebert, for many years chief chemist for the Houston production division of Gulf Oil Corp., died in Houston November 23. He had been retired from the company for two years.

Originally assigned by Gulf to the study of pipe line corrosion, Dr. Siebert became interested in oil and gas conservation. It is through his work in these fields that he was recognized throughout the industry as one of the pioneers in conservation.

He developed an electrical dehydration system which was combined with centrifugal force and pioneered in the development of drilling methods and in the use of many other devices now accepted as routine conservation procedure. Dr. Siebert and his associates started a mud school in the Gulf Laboratory in Houston, delving into all phases of the use of mud for drilling purposes.

### William Thomas Davis

William Thomas Davis, Canadian-American Exploration Co. executive, died at his home in Vancouver, B.C. on November 25. Born in Terrell, Texas, Mr. Davis moved to British Columbia five years ago. He was 56. A U.S. Navy veteran of World War I, he was a life member of the Shrine Crippled Children's Hospital and Masonic Lodges and Shrine Temples in Des Moines and Albuquerque. Burial was in Fresno, Calif.

### Ethyl Expands Research

Ethyl Corp. will spend over one million dollars in an expansion of its research facilities and technical services to the oil industry. The expansion will be undertaken at Ethyl's central research laboratories in Detroit and at its manufacturing center in Baton Rouge, according to an announcement by B. Bynum Turner, vice president in charge of research and engineering.

*"The nation's need for scientists, engineers, scholars, artists, administrators and specialists of all kinds has grown and continues to multiply. To meet this need is a function of the colleges and universities. A function of even more basic importance is to help develop a nation of informed citizens and to foster, in an expanding student population, the ability and will to achieve increasingly a society that offers freedom, opportunity and dignity to all its members."*

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## Charts Facilitate Calculations

Two new mathematical charts developed by E. J. George, Sun Oil Co. engineer, provide a convenient, economical tool that can be used for the same purpose as a slide rule or calculating machine.

The charts consist of a log scale superimposed diagonally upon a log-log grid. The multiphase mathematical chart includes scales for multiplication and division as well as those for obtaining directly the square root, cube root and logarithm of a number. The multiplication and division chart has the same pattern, but without the log square and cube root curves. Both charts contain examples illustrating the various mathematical operations which can be performed.

The standard charts, each used independently, have the same accuracy as a seven and one-half-inch slide rule. Values are read directly without the use of a straight edge as required with a nomograph. An added feature of these charts, in contrast to slide rule manipulation, is that the operator has a free hand to record values instantly as they are read. This factor, coupled with the elimination of time-consuming scale settings, account for the record speed with which the calculations are made using these charts. Comparative runs have shown the chart calculations to be 50 percent faster than those made with a slide rule, and twice as rapid as a calculating machine. The charts may be obtained at 25 cents each from E. J. George, 428 E. Magnolia Avenue, Aldan, Delaware County, Pa.

## Diamond Oil Well Elects Two

W. H. Pomeroy, Jr., and Kenneth K. Otto have been elected vice president and treasurer, respectively, of Diamond Oil Well Drilling Co. of Midland, Texas. Mr. Pomeroy was one of the original incorporators of Diamond when it was organized early in 1948. Mr. Otto joined Diamond in 1953. He was formerly chief accountant for Standard Vacuum in Sumatra.

*L. R. Boulware, vice president in charge of employee and plant community relations, General Electric Co., was guest speaker at the November 1 meeting of the New York Chapter of Nomads held at the Hotel Biltmore in New York City. One hundred eighty-five Nomads and their guests attended the party. Shown at the speaker's table (left to right) are: Norris L. Boulden, International General Electric Co., president, New York Chapter of Nomads; Mr. Boulware (speaking); A. J. Kelly, general manager of the purchasing department, Esso Standard Oil Co., toastmaster; A. A. Dill, Axelson Manufacturing Co., regent, New York Chapter of Nomads; and R. E. James, Security Engineering Division, Dresser Operations, Inc., treasurer, New York Chapter of Nomads.*

## Caterpillar Bulletin

A booklet titled "Old, But Still Producing," dramatically depicting the famous Caterpillar 'no parts orphans' policy is now available. This booklet contains various pictures of Cat machines still on the job after 20 years of steady service. It also shows the world's first diesel-powered track-type tractor, built in 1931, still hard at work.

The bulletin, Form D477, may be obtained from any Caterpillar dealer or by writing to Caterpillar Tractor Co., Peoria, Illinois.

## Corrosion-Resistant Alloy Valves

A completely new line of alloy gate, globe, and angle valves has been announced by Crane Co. Outstanding features of the new line are a unique and exclusive split-wedge disc design in the gate valves and an improved disc-stem connection in the globe and angle valves.

Materials in which the new valves are regularly available are Crane 18-8S Mo stainless steel and Craneloy 20 high-nickel, high-chromium stainless steel. Teflon packing is used in all the valves.

The split-wedge disc in the gate valves is made up of two identical, circular discs placed back-to-back in a carrier. The discs have a convex trunnion on the back and an integral circumferential flange which bears on guide slots in the valve body. Since the seating load is uniformly distributed over both discs, excessive force is not required for tight seating and there is no danger of buckling of the discs. This uniform pressure, plus freedom of the discs to rotate, is highly effective in reducing seat wear and preventing galling of seating surfaces.

In the new globe and angle valve disc-stem construction, the stem extends much farther into the disc, with a minimum amount of radial clearance. Chattering of the disc is eliminated and seat wear is greatly reduced.

## Joins Howe-Baker

Robert J. Phillips, formerly editorial director of *Petroleum Refiner*, has joined the Howe Baker Corp., Houston. He will manage the treating division of Howe-Baker, in addition to process engineering work for the desalting division. Mr. Phillips formerly was a member of the technical service division of Humble Oil and Refining Co. at Baytown. He came to the Gulf Publishing Co. as a department editor in 1952 and was subsequently promoted to editor and editorial director.


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## Sohio Reorganization

To handle the expanded activities of the manufacturing department of The Standard Oil Company (Ohio), a widespread reorganization and reassignment of duties involving ten departmental executives has been announced by Elliott B. McConnell, vice president in charge of manufacturing.

The manufacturing department technical divisions are reorganized as follows under Dr. F. J. Sanders, technical manager, who now becomes engineering manager: H. F. West will continue as chief of the general engineering division; E. N. Marsh, present chief of process design in the technical service division, now becomes chief of the new process engineering division; E. P. Kropp, present head of plant service section of the technical service division, now becomes chief of the process and products laboratory division; and Joseph August, present assistant to the technical manager, now becomes chief of the automotive engineering division.

Three new positions reporting to the engineering manager have been created: W. S. Schellentrager, chief process engineer at the Sohio No. 1 refinery in Cleveland, becomes process engineering coordinator; W. E. Scovill, present sectional supervisor in the process and development laboratory now becomes product coordinator; and R. I. Potter, present head of the fuels and lubes service division, will now act as automotive consultant.

Dr. E. C. Hughes, present chief of the chemical and physical research laboratory, will now fill the newly created position of research manager reporting directly to Mr. McConnell. Dr. Hughes will be in charge of all chemical and physical research activities except in the fields covered by the production department. Sohio, according to Mr. McConnell, is planning to increase during the next few years the size and scope of this activity, especially in the field of petrochemicals.

*Present at the meeting of the Los Angeles Chapter of Nomads at the Jonathan Club on November 3 were the following international guests and speaker of the evening: left to right (standing), M. Hulshiza of D. & E., from Arabia; E. Arch Brown, formerly with Shell in Venezuela; A. C. Martin of Gulf Oil Corp., from Tunisia; Lee C. Courteau of Gulf Oil Corp., from Sicily; Jack Stovall of D. & E., from Dhofar; W. C. Lance of I.P.C., from Qatar; Patricio de Solar of Santa Fe Drilling Co., Chile; Harold D. Devenish of Trinidad Oilfield Service, from Trinidad; (seated): Gus J. Jure of D. & E., from Arabia; W. P. Ries of I.P.C., from Bahrain; Roy C. Zornes of I.P.C., from Iraq; Stan Hill, speaker; H. H. Mitchell of I.P.C., from Iraq; and Thos. M. Webb of Texas Oil Co., from Venezuela.*

## New Construction Firm

Tuloma Builders, Inc., has been formed to handle engineering and construction of oil and gas facilities. Top personnel of Tuloma formerly were Midwestern Constructors, Inc., Tulsa engineering and construction firm. Clyde Wyant, formerly vice president of Midwestern, and now Tuloma president, said Midwestern will now specialize in pipe line construction and all work formerly handled by Midwestern's engineering and plant construction department will be handled by Tuloma.

## Sieves for Selective Adsorption

Linde Air Products Co. has announced the industrial advent of new types of synthetic, nonorganic zeolites which they call "molecular sieves," because they can separate mixtures of liquids and gases according to the sizes of the molecules of the substances composing the mixture. These zeolites are prepared by a process that allows control of the diameters of the minute pores of the material. In one grade the pores are just large enough to adsorb the small molecules of hydrogen sulfide, carbon dioxide, water and ethane, but are not large enough to adsorb propane. The next grade has pores large enough to take care of propane and other molecules of similar size. Besides separating substances according to molecular size, these "sieves" also separate molecules according to shape; for example, the grade that adsorbs propane will also adsorb similarly shaped molecules and straight-chain hydrocarbons like n-hexane, but not the branch-chained iso-hexanes. They have a high selectivity for unsaturated compounds and for all polar compounds. Waste refinery gases can be stripped of ethylene, acetylene, propane and butane.

The possibilities in other directions so far investigated seem very extensive. The speed of the adsorption process is remarkably fast, so that units much smaller than those required for other adsorbents like silica gel and activated alumina can be used. They have a very high capacity for water adsorption; one grade can adsorb 19 percent of water from a gas that contains only two percent. A further remarkable property is that, unlike silica gel and alumina, they are very active even at temperatures as high as 212°F. This discovery is considered as having greatly extended the previous limitations of adsorbing materials, and to have opened the way for adsorption to take its place with distillation and fractionation as methods of separating gases and liquids.


## BOOKS

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| FIELD GEOLOGY, 5th Edition—Frederick H. Lahee | $ 8.50 |
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## Book Review

*Geology of Petroleum*, by A. I. Levorsen; published 1954 by W. H. Freeman and Co., San Francisco, Calif.; 703 pages, 327 illustrations, 47 tables; $8.00.

This book is primarily for students who have had basic courses in geology, and for geologists who are actively exploring for oil and gas pools, with something that may interest the geophysicist, the reservoir surveyor, the production engineer and the wildcatter. But the main emphasis is on the reservoir with particular interest in the trap, the reservoir conditions of temperature and pressure, the different reservoir fluids and other circumstances that furnish indications of how oil reservoirs come to be formed. With this basic information to go on, the reader may be prepared to search for new pools, and to form a judgment on many questions in exploration, such as whether or not to lease, to drill, to test or to abandon. The leading purpose of the book is thus to discuss and to analyze the principles that are employed in the discovery process (which is the primary business of a petroleum geologist) rather than to randomly describe known oil pools or the techniques of obtaining the data that may be used. The book is divided into five parts: introductive summary and occurrence of petroleum; the reservoir; the petroleum pool; the geological history of petroleum; and applications wherein are considered subsurface geology, the petroleum province and the petroleum project.

## Expand Research Plant

Two new buildings and additions to a tank farm and power house will be erected at Gulf Research and Development Company's laboratories to expand its facilities for research into fuels and lubricants. The project, when completed with test engines and related apparatus, will cost in the neighborhood of $2,400,000.

## Unifining-Platformer Unit

The Texas Co. will erect a 9,000 b/d Unifining-Platformer unit at its West Tulsa refinery. The unit is one of ten such now building or operating in Texaco plants. Construction is to begin soon with completion scheduled for the summer of 1955. Refinery Engineering Co. is contractor.

## New Foundation Fill

For strengthening foundations where fill is required or for tie-downs of any nature, Van Dyke Industries has developed a newly patented device called the EZY Pier Anchor. Because of its simplicity of application and great holding strength, it serves many useful purposes in the oil industry either as a permanent or temporary support.

As an anchorage for derricks, power cranes, radio towers, workover rigs, wire lines or offshore drilling structures or wherever strong support and powerful tension are required, it is a dependable tool that can be quickly installed and relied upon for indefinite service.

## Magcobar Opens New Headquarters

Magnet Cove Barium Corp. formally opened its new office and laboratory building at 3403 Buffalo Speedway recently in one of Houston's newest industrial areas. The building is of modern design with end walls of brick and north and south all-window curtain walls. Wide overhangs protect the window walls from the sun. Porcelain panels below the windows provide colorful trim. The building is of lift-slab construction and has an area of 29,360 square feet. A detached garage has an area of 3,400 square feet.

General and executive offices, a research library and snack bar are in the south wing of the building. Executive offices, which are paneled in rare woods, overlook a landscaped patio.

Magcobar drilling mud research and product development laboratories are located in the north wing. Three laboratories are devoted to research and the development of new products. A field service laboratory is equipped for running tests on problems too complicated to be solved by the men in the field. An engineer training laboratory serves both driller and Magcobar engineers.

In the analytical laboratory a constant control is kept on all Magcobar products and production samples are double checked to ensure uniformity. A laboratory has also been provided to test new ore deposits.

To increase its facilities for the production of Magcobar mud weight, two new barite plants were built last year to supplement the Magnet Cove, Ark., plant. The first of these is in Brownsville, Texas, located to serve the southern Gulf Coast area, Mexico, and South America. This plant receives high-grade ore from Mexico and other foreign sources.

The other new barite plant is located in New Orleans. The plant's location on New Orleans deep water Industrial Canal is convenient to Gulf Coast drilling activity. This installation processes imported and domestic ore for rail, truck, barge and deep water movement to the consumer. Special equipment is provided for the processing and warehousing of quebracho and other drilling mud chemicals. Facilities have also been provided for the production of granular barite aggregate for use in heavy concrete coating of oil and gas transmission lines.

Magcogel is produced in the company's bentonite plant located at Greybull, Wyo. Magcobar has clay mining facilities at Zavalla, Texas. Plants for manufacturing oil mud and oil emulsion compounds are located at Houston and Odessa, Texas and New Iberia, La. Feeder warehouses to assist 400 dealers are located in New Orleans, New Iberia, Houston, Corpus Christi, Casper, Wyo., and Olney, Ill.


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## Houdry Man Honored

Henry D. Noll, director of the engineering division, Houdry Process Corp., was honored at a luncheon in November which marked ten years of service with the pioneer company in catalytic processes. Among those present to see him awarded a service pin were president Chalmer G. Kirkbride, vice presidents Claude C. Peavy and George H. Daft, manager of research and development Jack C. Dart, engineering manager A. Welsley Hoge, sales manager Rophie E. Bland, commercial development engineer George F. Hornaday, and Pierre Quilleret, general consultant and liaison French associate.

Mr. Noll joined Houdry in 1944 with 20 years of petroleum experience behind him. Four years later, he was made manager of engineering, and in 1952, director.

## New Shell Platformer

The third UOP Platforming unit built for the Shell Oil Co. went on stream recently at the company's Wood River, Ill., refinery. A 5,000 b/sd Platformer is in operation at Martinez, Calif., and a 16,000 b/sd unit at Houston, Texas. The 16,000 b/sd unit at Wood River is producing 95 leaded octane Platformate for motor fuel blending. Universal Oil Products Co. designed, engineered and licensed the Platforming unit. Procon, Inc., was the contractor.

## New Rockwell District Offices

Rockwell Manufacturing Co., meter and valve division, has named three new district managers, established a new district office at Shreveport, La., a new West Texas branch office at Midland, Texas, and converted its Dallas sales office into a district as well as a regional headquarters office. The three new district managers and their districts are: Dean Collins, Shreveport; Edward D. Propps, Dallas; and Herbert M. Logan, Tulsa.

## Cooling Tower Bulletin

"Cooling Water for Industry" a detailed explanation of cooling tower construction and applications, has been published by The Fluor Corp., Ltd., Los Angeles 22, Calif. The 36-page publication, designated as CT-KE-0.002, illustrates and describes Fluor induced-draft cooling towers.

## Book Review

*The Chemistry of Petroleum Hydrocarbons*, edited by Benjamin T. Brooks, Cecil E. Boord, Stewart S. Kurtz and Louis Schmerling with 21 collaborators; published 1952 by Reinhold Publishing Corp., New York 22, New York; 664 pages; $18.00.

This valuable volume is just what its title indicates, a book on the chemistry of petroleum hydrocarbons. It touches lightly on much of the process engineering, apparatus design, and analytical and testing methods relating to petroleum refining and the many uses of petroleum products: these subjects are well covered in other books. Within the field they have thus marked out, the editors and collaborators have free scope for a discussion of the fundamental chemistry of many industrial processes involving hydrocarbon chemistry. The mechanisms of these hydrocarbon reactions are treated in the light of the latest theoretical considerations and applications of many physical methods which have been of the greatest importance in throwing light on the structures of the more complex hydrocarbons present in petroleum oils.

Within this frame of reference, the petroleum chemist and his colleagues in other divisions of organic chemistry will find the basic information they may need in understanding or investigating the compositions and structures of petroleum hydrocarbons, their physical properties, and procedures for their separations and for synthesis.

## Completes Modernization

Lake Superior Refining Co., Superior, Wis., has completed an extensive two-year modernization and expansion program. Latest unit to go on stream is a 1,000 b/d UOP Platforming unit, which went into operation on October 13. Included in the modernization program was a new vacuum distillation and asphalt unit for the production of a complete range of asphalt products. Also, the crude unit and thermal unit were modified for increased operating efficiency.

The Platformer was built by Procon, Inc., in unusually fast time. Only 24 weeks elapsed from the time Procon received authority to begin engineering until the unit was completed and accepted by Lake Superior. All of the engineering, purchasing and construction was done within the 24-week period.

## McCullough Sales Engineers

I. J. McCullough, president of McCullough Tool Co., has announced the recent appointments of G. D. Wiley and W. P. Maurath as sales engineers in the mountain division area. Mr. Wiley will be working out of McCullough's Vernal, Utah service branch. He was formerly employed by Baroid. Mr. Maurath has been assigned to the recently opened Cody, Wyo. branch. He has been with McCullough since 1941.

## Hawthorne Appoints Distributors

Herb J. Hawthorne, Inc., Houston, Texas, manufacturers of "Blue Demon" exploration drilling bits, has appointed four new distribution outlets in the Rocky Mountain area. They are: Anderson Seismograph Bit Service, with stores in Casper, Wyo., Grand Junction, Colo. and Sidney, Mont.; and O'Tool Bit Co. in Cortez, Colo. J. Grey Wofford is the dealer.


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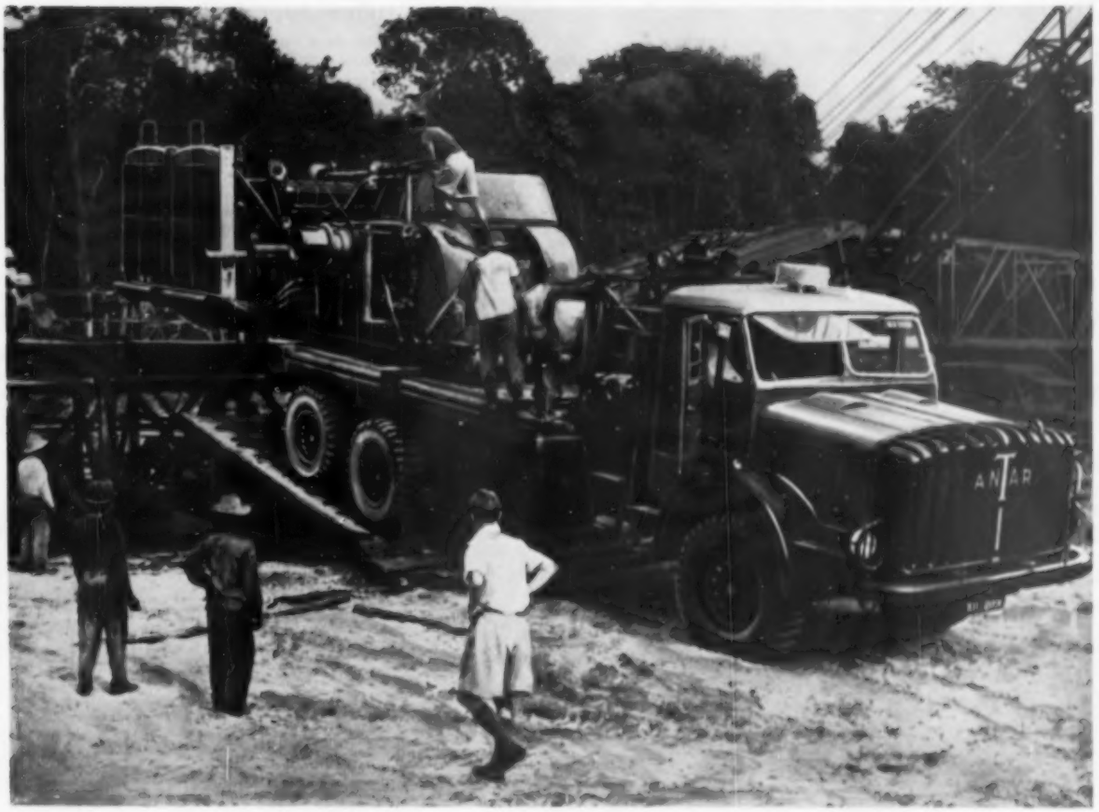


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## Describes New Grease Thickener

A new class of grease thickeners, estersils to make non-melting multi-purpose greases which can be boiled in water for several days without breaking down, was described at the recent annual meeting of the National Lubricating Grease Institute.

The paper, the first to be given on the development of the du Pont Company's new grease thickener being marketed by the petroleum chemicals division, was prepared by Dr. G. C. Meyer of du Pont's petroleum laboratory and R. O. Braendle of the petroleum chemical division.

The new grease thickener, called Estersil GT, makes possible multi-purpose greases having high shear stability with both heat and water resistance. These greases were said to show relatively small changes in consistency under wide temperature variations. Mr. Meyer said that uninhibited estersil greases have excellent oxidation and mechanical stability and may be manufactured by a simple milling operation. They are compatible with other commercial greases. "They are buttery and transparent and have the bloom of the oil from which they are made," Dr. Meyer told the group.

## Oil Recovery Chemicals

Orchem Corp., Austin, Texas, has published a folder describing chemicals for continuous or single treatment of oil wells to increase secondary recovery. The chemicals, in general, are surface active agents, special bactericides and corrosion inhibitors or compounds to improve efficiency of water injection.

## Industrial Engines

A technical bulletin prepared by the industrial engine department of Willys Motors, Inc., Toledo, Ohio, describes two 6-cylinder industrial engines. Power curves, engine specifications, engine illustrations, special features and other pertinent information is included.

*Hosts at the Fluor open house at the new research headquarters at Whittier, Calif., were (left to right) J. S. Fluor, president; W. R. Hainsworth, vice president in charge of research; F. E. Fischer, secretary-treasurer; C. L. Blohm, manager of research; M. A. Ellsworth, vice president and director of sales; and J. R. Fluor, executive vice president.*

## Fluor Adds New Research Facilities

On October 15 and 16, 1954, The Fluor Corp., Ltd. held an open house at the new research division in Whittier, Calif., attended by customers, employees, civic and community leaders. The building is comprised of 17,000 square feet of air-conditioned office and laboratory space in addition to two acres devoted exclusively to pilot plant construction and operation. The two-day observance climaxed plans which began in 1941 when Fluor first initiated a modest research program.

The working facilities include nine laboratories equipped with research in many engineering and processing phases, a machine shop, photographic dark room and stock rooms. At the rear of the site is the 2-acre pilot plant area for testing large equipment used in the processing industries. Present projects in operation in this area include a pilot compressor station, a plant for fertilizer studies, a solvent extraction test plant, evaporative cooling test apparatus and a unit for checking performance of heat exchangers.

## New Supertankers to be Built

Four new supertankers are being built under the new tanker trade-in legislation passed by Congress at its recent session, it is announced from Washington.

Esso Shipping Co. is trading in five war-built T2 tankers to the government for a credit allowance of about $5 million. Esso is using the credit and other funds for construction of two new supertankers costing $16 to $17 million. The new vessels will be of 35,550 tons deadweight, will be 690 feet long and have high speeds.

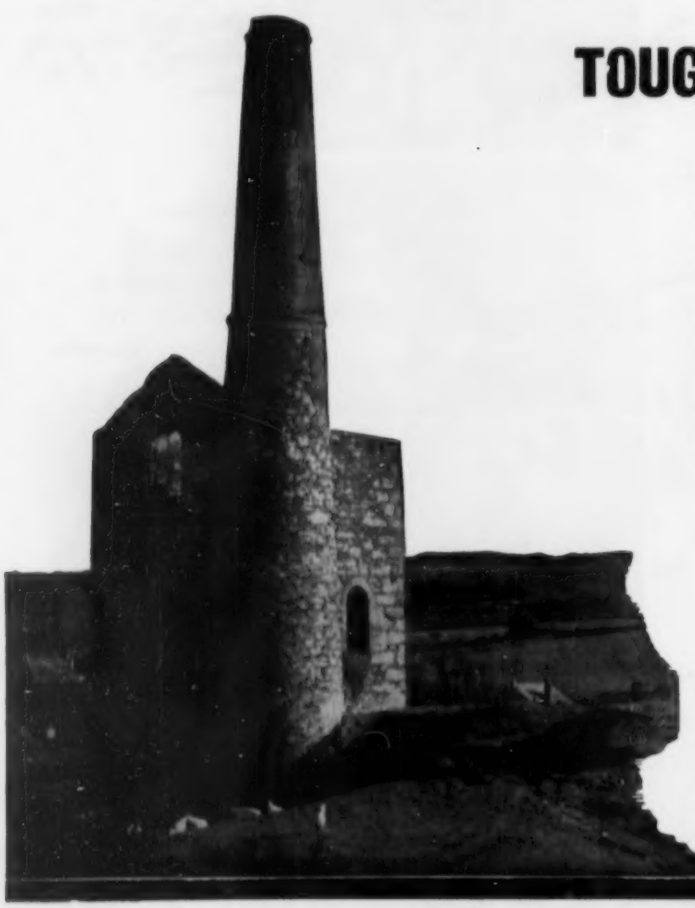
Cities Service Co., meanwhile, is trading in five tankers against the construction of two large, modern supertankers. In April 1955, when two more Cities Service tankers become 10 years old and thus eligible for trade-in, they will be turned over to the government, and a third new tanker will be built, the Department of Commerce says. The new Cities Service tankers will have a speed of 17 to 18 knots and be designed to lift about 800,000 barrels of liquid cargo.

When all these transactions are completed, they will put 12 vessels in the laid-up reserve of tankers. The credit allowed for the seven Cities Service tankers will come to about $7 million, the Commerce Department states.

The trade-in bill provides that companies may turn in tankers 10 years or more in age to the government and receive a credit toward the construction of new supertankers. The government has set up standards as to vessels it will accept under this plan.

## Tubeseal Floating Roofs

Hammond Iron Works has published Bulletin TS to describe design features and operation of its new Tubeseal system to eliminate all the vapor space in the seal area, thereby preventing vapors from forming and to provide a tight seal at all times. Copies are available from Hammond plants and offices located in New York City; Warren, Pa.; Bristol, Pa.; Birmingham, Ala.; Casper, Wyo.; and Provo, Utah.

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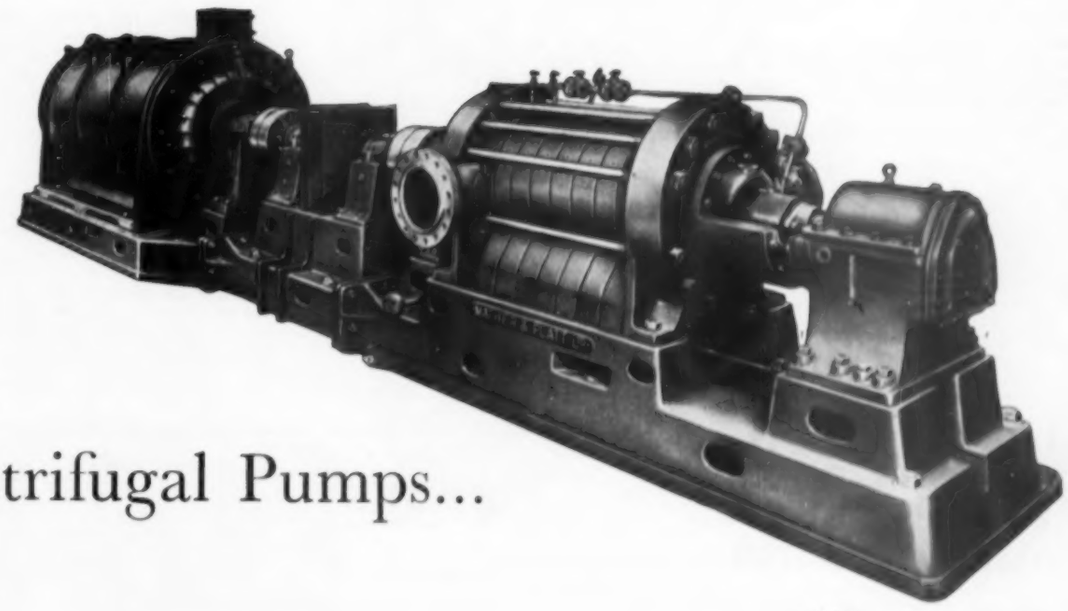

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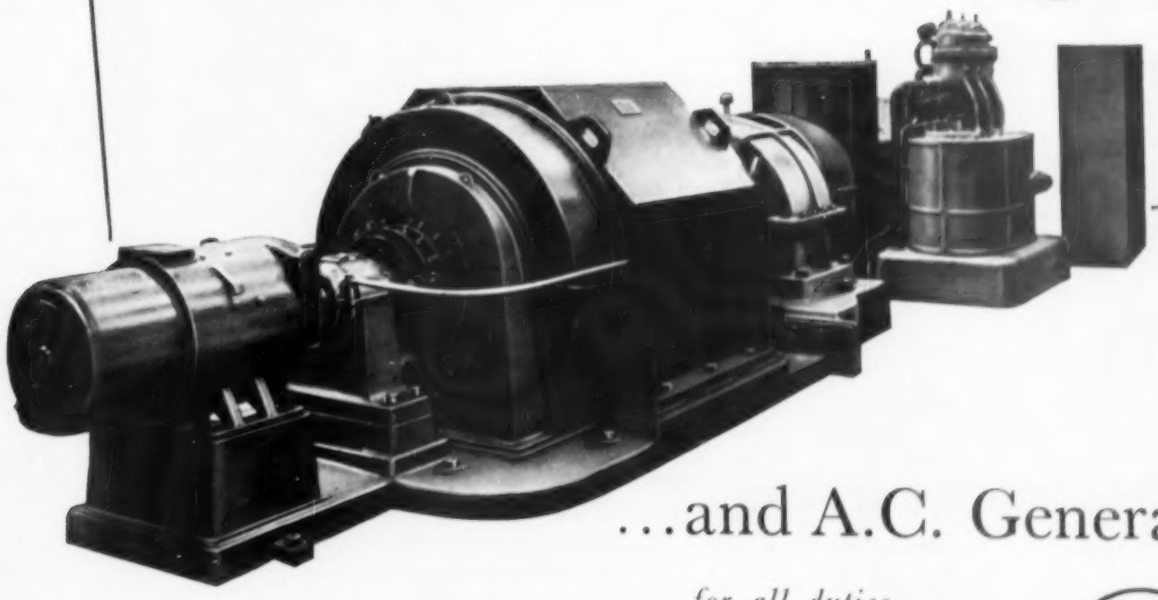

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## Shell Appointments

Shell Oil Co. has appointed new managers at refineries at Houston, Texas and Martinez, Calif. and Shell Development Co. has named a new manager at the Emeryville, Calif. research center.

John A. Tench is the new manager of the Houston refinery, succeeding Paul E. Hurley, who died recently. Mr. Tench, who has been manager of the Martinez refinery, is being succeeded there by Bruno Stolley, formerly manager of the Emeryville laboratory. Replacing Mr. Stolley is John R. Morrison, who has been assistant manager of Shell Oil's industrial relations department.

Mr. Tench, who has been with Shell for 26 years, has spent most of his career in the company's West Coast refineries. From 1939 to 1946 he was in charge of operations in the San Francisco office manufacturing department. He became superintendent at Martinez in 1946 and was promoted to manager in 1949.

Mr. Stolley, who started with Shell in 1929 in the engineering department at the Norco, La. refinery, became assistant chief engineer at Houston in 1934. In 1946 he was appointed assistant manager of the head office personnel department in New York. He was named manager at Emeryville in 1949.

Mr. Morrison joined Shell at the Houston refinery in 1938. After holding positions in chemistry and technology, he was named assistant industrial relations manager at the refinery in 1946. He was transferred to the head office in New York in 1948 and became manager of the policy and training division of the personnel department in 1951. He advanced to assistant manager of the industrial relations department early this year.

## Compact Reheater

Oriental Refining Co., Denver, Colo., has increased the output of its crude distillation unit 16 percent using a newly developed hot oil heater to reheat reduced crude. At present, 15 gpm of reduced crude is drawn from the bottom of the crude fractionating tower at about 630°F and pumped through steel coils of a Vapor-Clarkson hot oil heater, where the temperature is raised 150° to 780°F. The reheated reduced crude is pumped back into the crude distillation unit. Output of the tower has been increased from 60 to 70 barrels per hour by the method.

Johnson Mossman, superintendent of Oriental's refinery in Denver, worked with Vapor Heating Corp. engineers in Chicago developing this new oil heater that would deliver these high temperatures in a small compact machine which is only a little larger than a home refrigerator. The heater is similar to the Vapor-Clarkson steam generators the company makes for diesel powered passenger trains. The generators are also mounted on trucks used in the oil fields to produce 600 pound steam for cleaning paraffin out of pipe lines.

## Specification Catalog

A new specification catalog E-133-D, on the UD-1091 190 B.H.P. power unit and 203 B.H.P. engine is offered by the International Harvester Export Co., 180 N. Michigan Ave., Chicago 1. Specification sheets on International TD-18A track mounted cable bulldozer (E-136-D), TD-18A track mounted hydraulic bullgrader (E-139-D) and the International TD-24 pusher plate for mounting directly to tractor frame (E-148-D) also are available.

## Installs High Speed Computer

Socony-Vacuum Oil Co., Inc. has installed an electronic digital computer (Mobilac) at its research and development laboratories at Paulsboro, N.J. It is believed to be the largest and fastest computer installed by any oil company and replaces a smaller one. A twin will be installed early next year at the field research laboratories of Magnolia Petroleum Co., Dallas, Texas, where it will be put to work solving problems of exploration and production.

To conduct the Paulsboro program, a mathematical model of the Paulsboro refinery, using numbers and formulae to represent processing units, has been constructed. The model consists essentially of a group of about 100 equations which express mathematically the behavior of catalytic cracking, reforming, and other processing and blending units at the refinery. These equations are punched on cards, which are read by Mobilac and stored in its memory.

Next, additional punch-cards containing data on crude oil characteristics, available charge stocks, motor gasoline specifications, product commitments, and other operating conditions and requirements are fed into the computer. Mobilac can solve problems in algebra, calculus, or logic. It can add or subtract 500 ten-digit numbers a second, multiply 120 a second, and divide 85 a second. It can remember more than 4,000 ten-digit numbers. It can make choices or decisions based on the results of its calculations. In the field of production, Mobilac will be used to develop improved recovery methods. In refining, Mobilac will be used in combination with a mass spectrometer to make more rapid and much more detailed analyses of crude oil, lubricating oil stocks, and waxes than any presently used analytical tools.

# ANGLO-IRANIAN OIL COMPANY, LIMITED

NAME CHANGED TO

# THE BRITISH PETROLEUM COMPANY LIMITED

### CAPITAL INCREASE AND SCRIP ISSUE APPROVED

At an Extraordinary General Meeting of the Anglo-Iranian Oil Company, Limited held on 16th December in London, England, the proposed increase of capital and scrip issue, and the change of the Company's name to The British Petroleum Company Limited were unanimously approved.

Sir William Fraser, C.B.E., LL.D. (the Chairman), before putting the proposals to the Meeting, in the course of his speech said:

First of all, certain adjustments will have to be made in the balance sheet as at 31st December, 1954, of the parent Company, and also in the consolidated balance sheet, arising from the settlement made in connection with our interests in Iran. The main differences on the Liabilities side will be the disappearance of the Special Contingencies Account; there will also be adjustments in Provision for Taxation. On the Assets side we shall be eliminating all those relating to our former interests in Iran. It is anticipated that all necessary adjustments can be effected without drawing on General Reserve Account.

As described in the statement posted to Stockholders on 30th October, the Company is to receive, over a period of years, a net payment of £25,000,000 from the Iranian Government and, related to production, approximately £214,000,000 (at the current dollar exchange rate) from the other Companies participating in the Consortium as a result of the agreements recently concluded. It is intended that these sums should be utilised for the further development of our business and it is reasonable to expect that they together with depreciation provision, should go far towards meeting our future capital requirements.

#### Unusual circumstances from 1946 onwards

It may be recalled that from 1946 onwards I have frequently stated that but for unusual circumstances larger dividends on the Ordinary Stock would have been warranted.

For the whole period from 1947 to 1953 £107,500,000 were allocated to General Reserve and £6,000,000 to Preference Stock Reserve, a total of £113,500,000, while during the same period the distribution to Ordinary Stockholders totalled £24,750,000. Total capital expenditure during the same period was over £340,000,000, largely financed from depreciation provision and amounts placed to reserve.

#### Future Dividends

In 1953 our capital expenditure amounted to £75,000,000 and in the current year is about £55,000,000; the principal capital projects now in hand should shortly be completed and during next year and for some time capital expenditure will, I expect, be on a smaller scale. It should therefore be possible in future to distribute as dividends a larger proportion of the profits available. I would remind Stockholders that our profits depend on conditions prevailing throughout the entire industry and that the oil industry is liable to severe fluctuations from time to time.

It is your Board's intention in future to make any interim dividend payment larger in relation to the expected total annual payment than has been the case in the exceptional circumstances of recent years.

I will only add that our profit margins this year are less than last, but with the increased quantity of our sales I expect that our earnings for 1954 will not greatly differ from those of 1953.

#### The Company's New Name

The new name proposed for the Company conforms with its overall operations and changed position in the Iranian Oil industry. The Company's main trade mark remains BP, as first adopted in 1921 and of recent years incorporated in the titles of most of our subsidiary and associated marketing companies.

Proposing a vote of thanks to the Chairman, Board, and Staff, Sir Arthur Evans said: Had it not been for the patience exercised by the Board and the guidance given by the Chairman, I do not think we should have been meeting thus today. We wish to thank the Chairman, Board, and Staff at home and overseas for splendid teamwork in unparalleled times.


# BOOKS

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| PETROLEUM REGISTER (International Petroleum Register)—31st Edition, 1954 | $15.00 |
| PERFORMANCE OF LUBRICATING OILS—H. Zuidema | $ 5.20 |
| PETROLEUM PRODUCTION ENGINEERING—L. C. Uren "Oil Field Development" | $ 9.20 |
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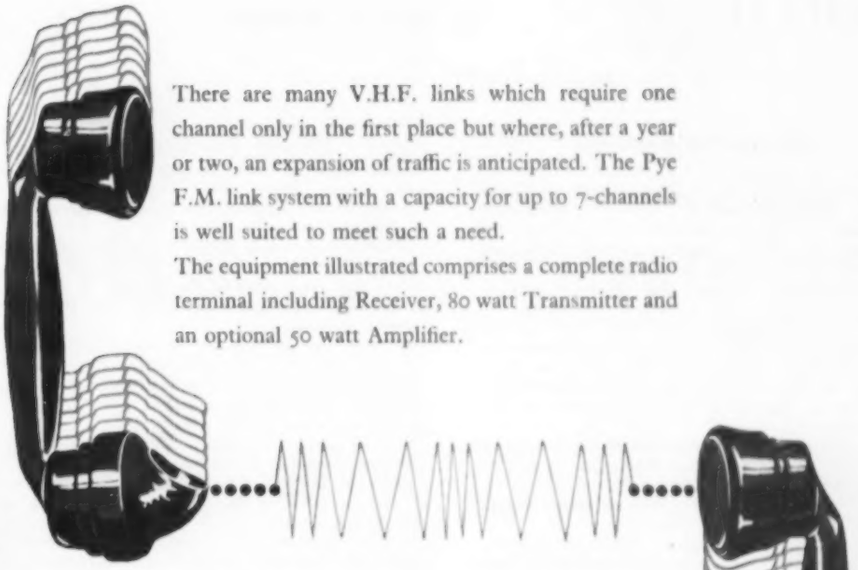

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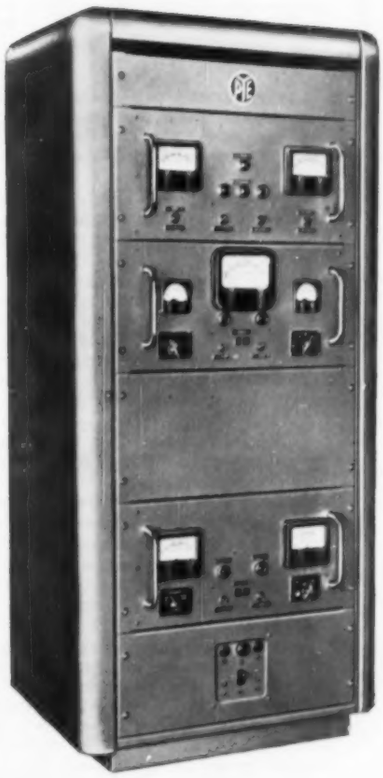

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10 watts, or with Amplifier Unit — 50 watts

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**Overall Transmitter-Receiver Performance**

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# Washington PIPE LINE

By Joseph B. Huttlinger

### *Offshore Oil Revenues*

What's the offshore oil worth?

One more guess comes from Secretary of the Interior Douglas McKay. He estimates that there are 11.5 billion barrels of oil in the submerged lands off the coasts of the United States. He says this is worth, at current prices, more than $30 billion. Beyond that, there is natural gas to be found.

The Secretary estimates the U. S. will receive $1 billion in drilling rights, or down payments, from petroleum companies. The U. S. stands to take in $5 billion more in royalty payments, which are at one-sixth the value of the oil and gas produced.

Already, the U. S. has taken in $144 million for drilling rights for some tracts off the coasts of Louisiana and Texas. The tracts are but three percent of the total offshore, undersea lands mapped as potentially oil-bearing.

As for the coastal states—Texas, Louisiana, California and others—their revenues from tidelands oil may be about $1 billion in all. This is the estimate of impartial observers, using many of the same estimates as the Secretary. This is not, however, the estimate of the Secretary.

These figures, if they prove valid, indicate that the tidelands legislation of 1953, far from being a giveaway to the states, means handsome revenues for, above all, the federal government.

That legislation gave the U. S. title to the outer belt of the offshore lands, and the coastal states the inner belt. Actually, the legislation failed to end once and for all the scrap over who owns what. The next step in the tidelands drama is likely to be a law suit, probably filed by the U. S. Government, asking the courts to state clearly just what is the boundary between state and federal areas of the offshore lands. This suit could come quickly; officials of Louisiana are pressing for a determination.

### *President Asks Expanded Highway Program*

President Eisenhower, in a special message to Congress at the end of January, asked for more spending on U. S. highways, and chances are that he will get much of what he asked.

The expanded highway construction program should mean more miles of highway, less congestion, and happier driving. All of this, in turn, points toward more sales of gasoline. The benefits in serene tempers, in saving of time, etc., are immeasurable.

The gist of the President's program is to spend more than $100 billion for highway improvement during the next ten years. This is about twice the amount of spending now in sight.

The states and federal government would share the cost. About $26 billion of the federal cost would be financed by a long term bond issue. The bond issue would be paid off, partly by excise taxes on gasoline. Whether the present two-cent levy would have to be hiked is doubtful. In any event, it is up to Congress, which must first pass legislation for the doubled highway program.

### *Natural Gas Regulation*

The drive to free independent producers of natural gas from federal price controls is already under way in the U. S. House of Representatives.

The measure was given a "full speed ahead" tag by Representative Percy Priest, D., Tenn., as the Congress opened its sessions in January. It may be July, however, before the final outcome is known.

"There has been a lot of misinformation on this proposal since the controversy started nearly five years ago," the Tennessee Congressman said. "By holding hearings, I hope the bill's provisions can be fully clarified.

"I will support the bill unless testimony shows that the situation is not as it was before." The Priest committee—the House Commerce Committee—is holding the hearings on the legislation in the House.

On the Senate side, a more dilatory course is expected. Senator Warren G. Magnuson of Washington, chairman of the Senate Commerce Committee, is opposed to the bill, but he will give the measure its day before the committee.

Beyond that, he is a close friend of Senator Lydon Johnson, D., Texas, one of the ardent supporters of the measure. While he may vote against it, Senator Magnuson will see that Senators have a chance to pass the bill if they want.

The aim of the bill is to exempt from federal price controls some 5,000 independent producers of natural gas. They had always been free of controls until last June 7, when the U. S. Supreme Court handed down its decision in the case of the Phillips Petroleum Co. That decision called for the U. S. Federal Power Commission to start price and other controls over natural gas production.

### *Commerce Department Sees Further Industry Expansion*

More expansion is ahead for the American petroleum industry.

The U. S. Department of Commerce estimated the industry will spend $664 million in the first quarter of 1955. This compares with $549 million in the first three months a year ago and $540 million in the first three months two years ago.

By years, the industry spent $2,790 million for new plant last year, $2,762 million the year before, and $2,535 million in 1952.

### *Natural Gas Prices*

Here is the lineup at the U. S. Federal Power Commission regarding higher rates for natural gas producers.

Generally sympathetic to higher prices for the producers are S. L. Digby, Frederick Stueck, and Nelson Lee Smith.

Less sympathetic, generally, are Chairman Jerome Kuykendall and Claude L. Draper.

The attitude of the commissioners, one of the best kept secrets, has come in a series of opinions from the commission.

### *Taxes And The Oil Industry*

The tax story of the coming year is yet to be written, but chances are that the U. S. Congress will keep the income tax on oil and other corporations at 52 percent. President Eisenhower has asked for this.

The President also wants the income tax rate on foreign operations of U. S. firms reduced by 14 percent, to 38 percent. Congress will take a close look in the coming months.

The gasoline excise tax of two cents a gallon is likely to stay at the present rate, although this is eyed as a major source for financing the President's proposal to double all spending for highways to $101 billion in the next 10 years.

### *FPC Still Working Out Gas Plan*

The U. S. Federal Power Commission is as far away as ever from working out a definite plan for regulating the price of natural gas sold by independent gas producers to long distance pipe lines.

At least three major hearings have been held by the FPC, the last starting January 11, on ways and means to regulate the prices. The FPC has issued a number of regulations, but it has yet to decide, finally, just how to impose the controls.

Shall price controls, for instance, be based on a freeze of prices as of the date the FPC took control? Shall they be based upon a return of a certain percentage, say eight percent, to gas producers? Shall a single price, say ten cents a thousand cubic feet of gas, be fixed for each producing field? If the rate of return theory is used, what part of the cost of drilling wells is for gas wells and what for oil wells?

These are burning questions at the FPC, and the answers are not in sight.

In fact, the majority of members of the FPC truly hope that the U. S. Congress will resolve the whole question by removing the producers from FPC controls.

### *Petroleum And The New Congress*

The American petroleum industry at home and abroad has a big stake in what the U. S. Congress and President Eisenhower do in the next six months. Three issues are of paramount concern.

They are the coming struggles over federal regulation of natural gas producers, the depletion allowance, and imports of crude and residual oil into the U. S.

On the first two, the petroleum and natural gas industries are united. They want federal gas regulation removed by legislation, and the depletion allowance held at 27.5 percent. Chances are they will win both battles, in the end, but the gas battle, in particular, promises to be close and hard-fought.

On imports, the industry is split. American producers want restriction by law or otherwise on the amount of oil that can come into the U. S. Odds seem on the side of the importers, with President Eisenhower himself calling for freer trade and lower, not higher, tariff barriers.

Tankers will be in the news, as the Congress takes a look at two measures passed last year to spur on tanker construction: the trade-in bill, and the government's signing of long term charters for vessels yet to be built.

Anti-trust legislation may come up as a result of recommendations of a committee named by Attorney General Herbert Brownell, Jr., to study the laws. Of interest to petroleum is the recommendation on whether the U. S. anti-trust laws apply outside the U. S. More Alaska land may be opened for exploration by oil companies, and air pollution and smog problems may be aired by Congress. Gasoline prices are due for a hearing by the Senate Small Business Committee.

The Defense Production Act, carrying certain financial incentives to U. S. firms for expansion, will come up for extension in the coming months. So will the Interstate Oil Compact. A number of regular appropriations bills for all government agencies will be up again. The Oil and Gas Division of the Department of the Interior is one of them.

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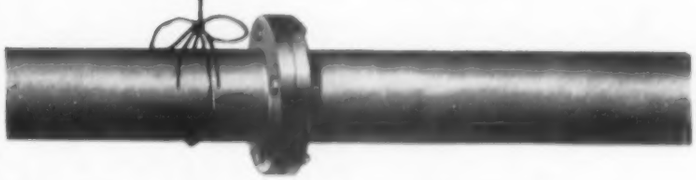

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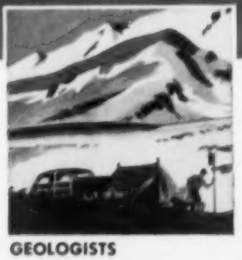
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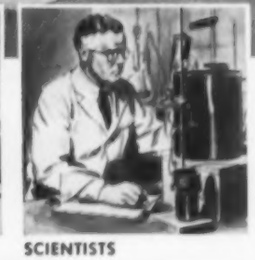
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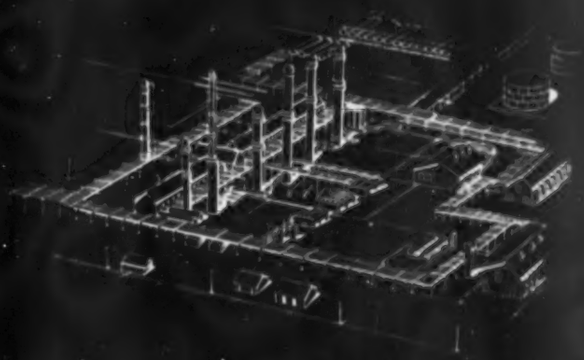

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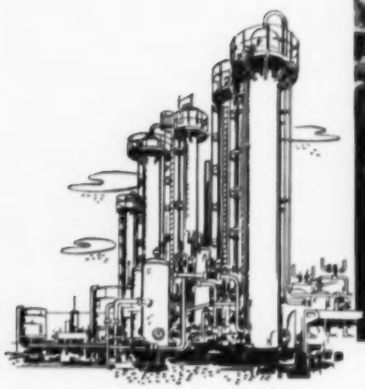

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